Automating Geodatabase Creation with Geoprocessing

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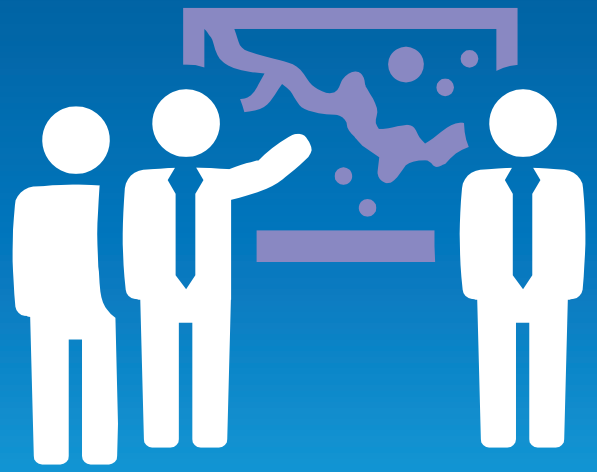
Technical Workshop

Assumptions

- Geodatabase fundamentals
- Experience with geoprocessing (GP)
- Understanding of geodatabase design



Agenda

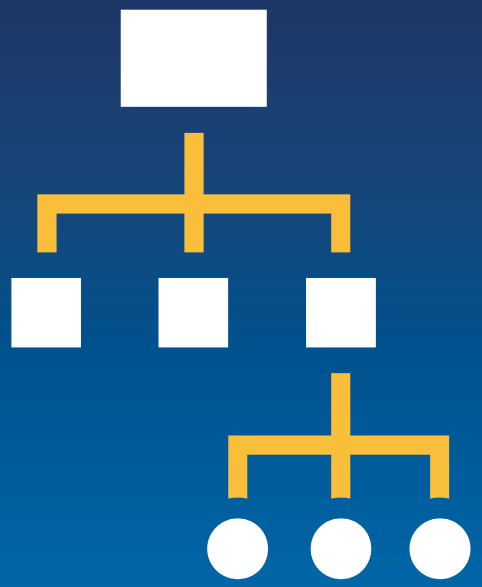
- Geodatabase creation options
- Geoprocessing review
- Schema creation in ModelBuilder
- Making model tools
- Using Python
- Making schema changes
- Enterprise considerations

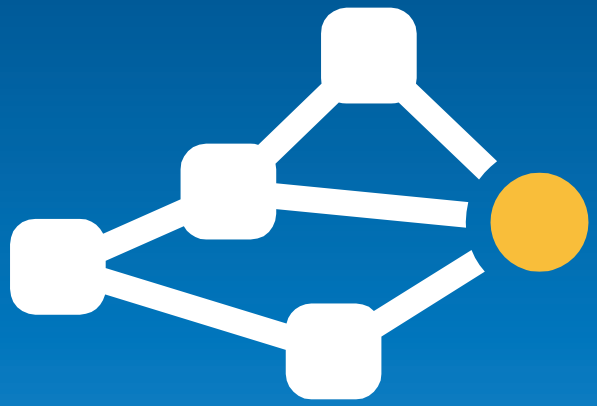
Geodatabase Creation Options

Schema Creation Options

Pros vs Cons

- ArcMap/ArcCatalog wizards
- Data Models (Solutions/Templates)
- UML
- Geoprocessing





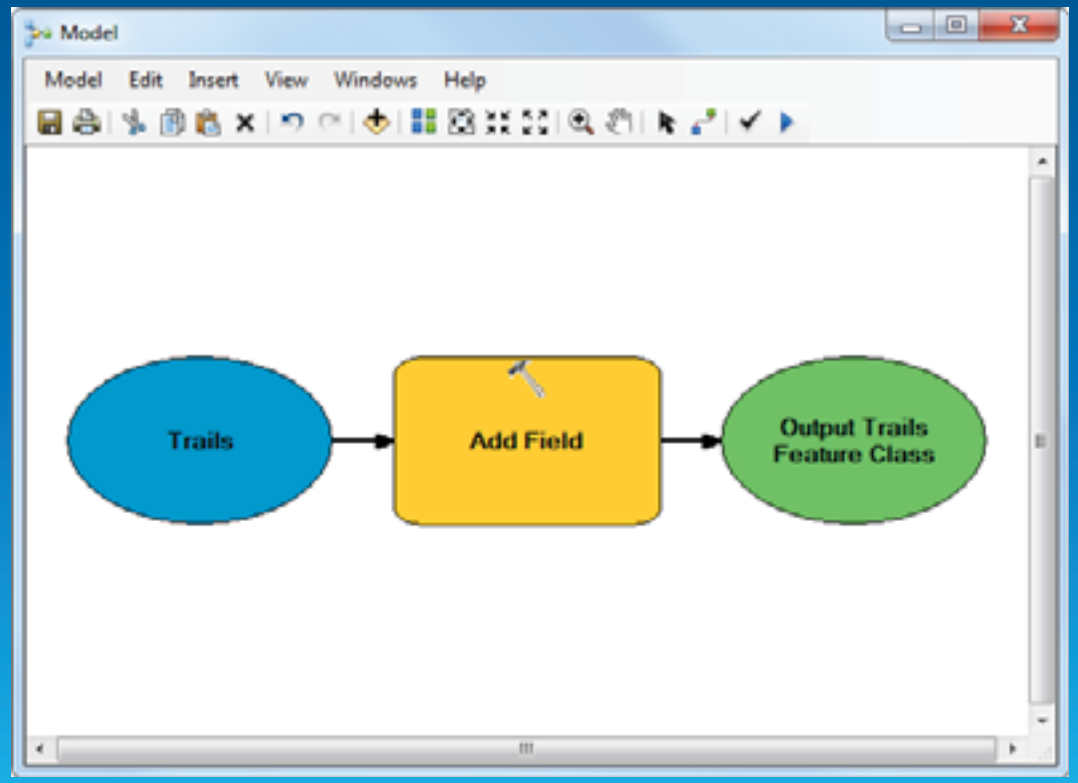
Geoprocessing Review

What is geoprocessing?

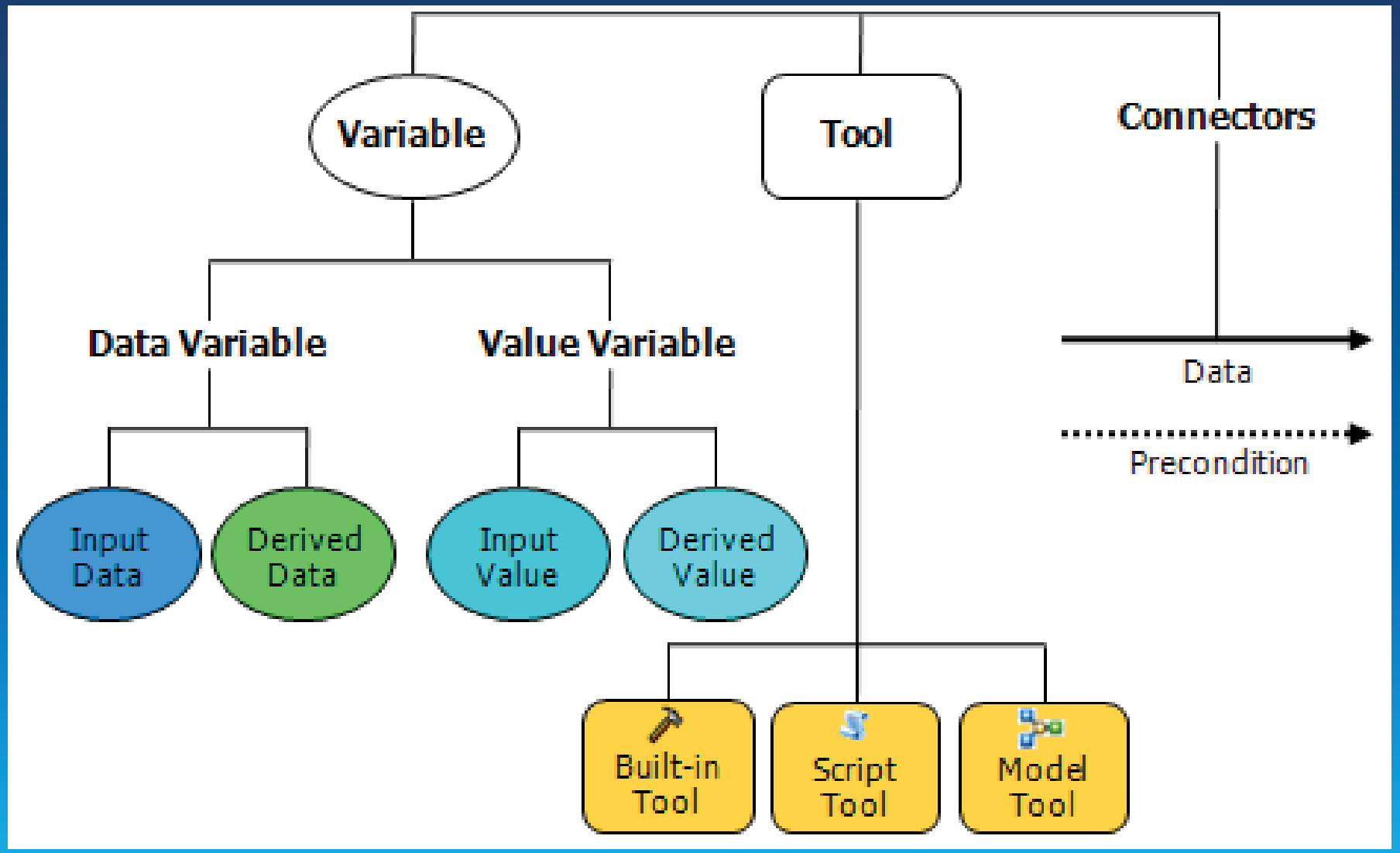
- Suite of tools
  - Over 1000 tools and functions
  - Analysis
  - Data conversion
  - Dataset creation
- Framework
  - Link tools together (ModelBuilder)
  - Share/publish
  - Script and customize

ModelBuilder

- Create, edit and manage models
- Re-run workflows
- Visual programming language

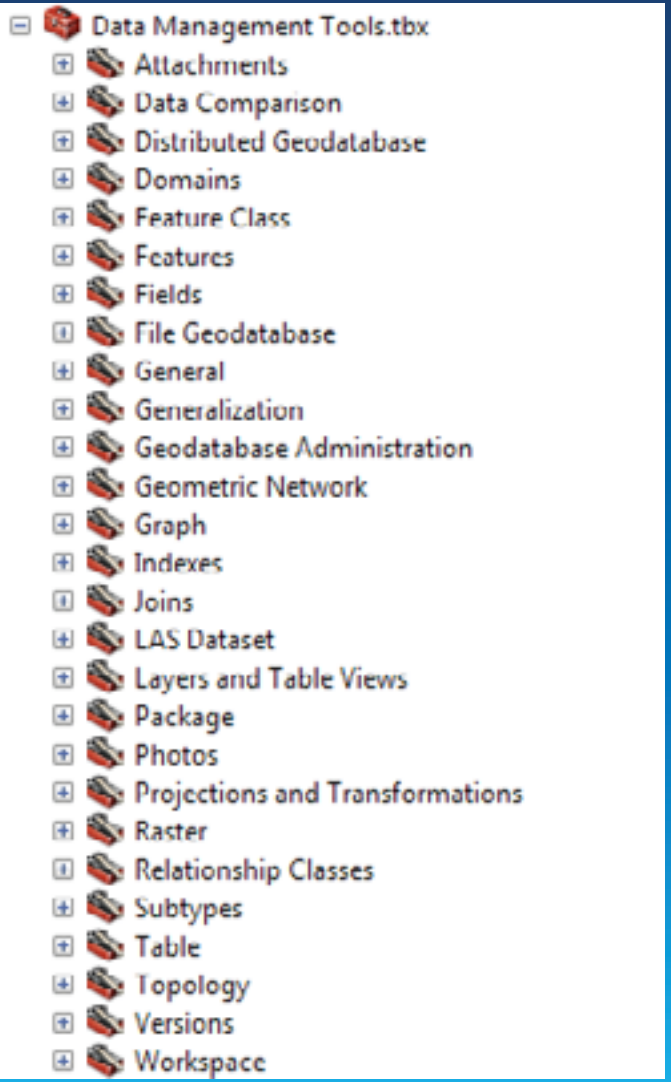


Model Elements



What tools should I use?

- Look in Data Management toolbox
- Many tools to create geodatabase objects



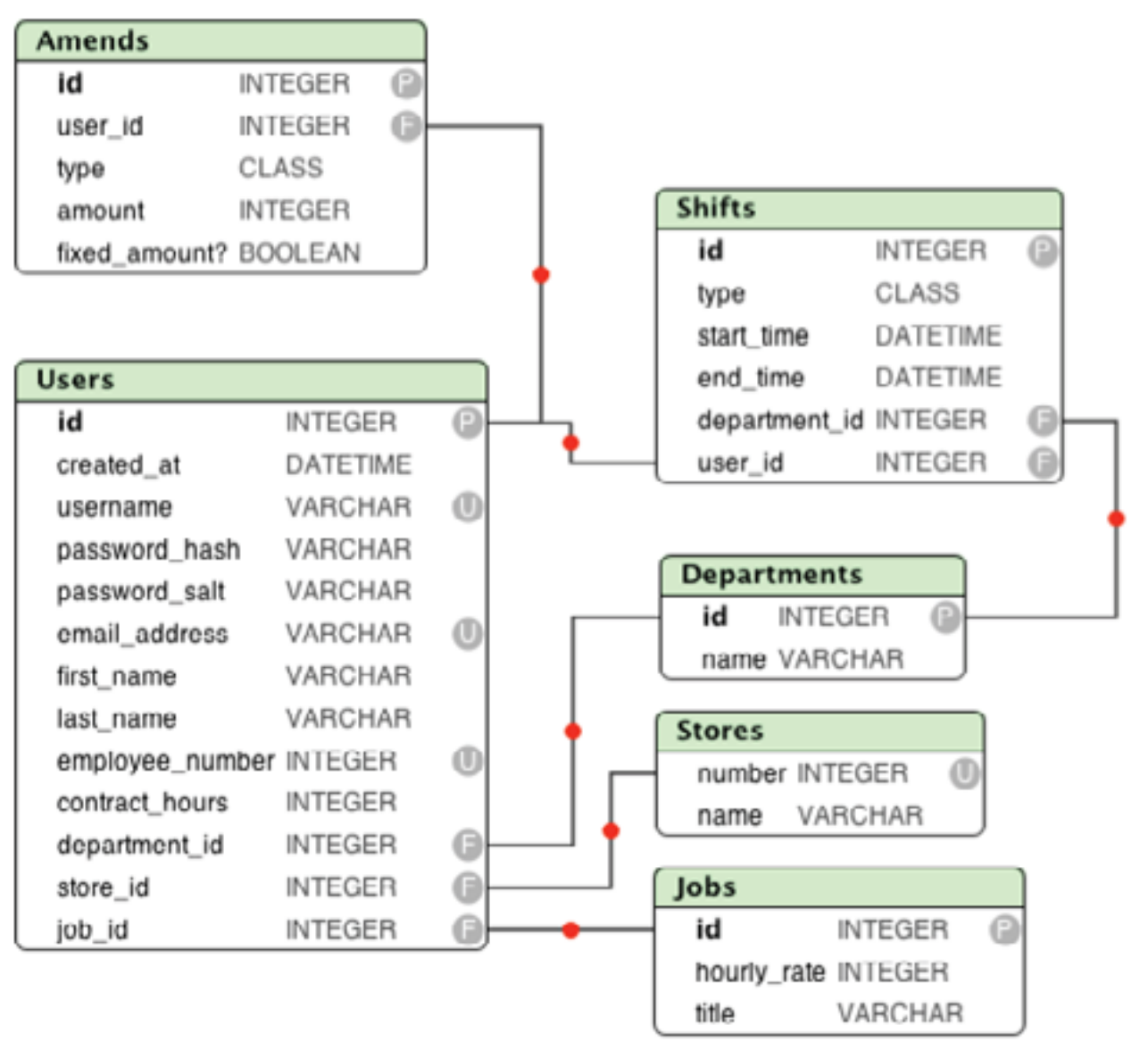
Demo 1

ModelBuilder Review

Discover tools
Renaming model elements
Creating basic schema
Pop-ups for gathering info

Schema Creation

What is schema?



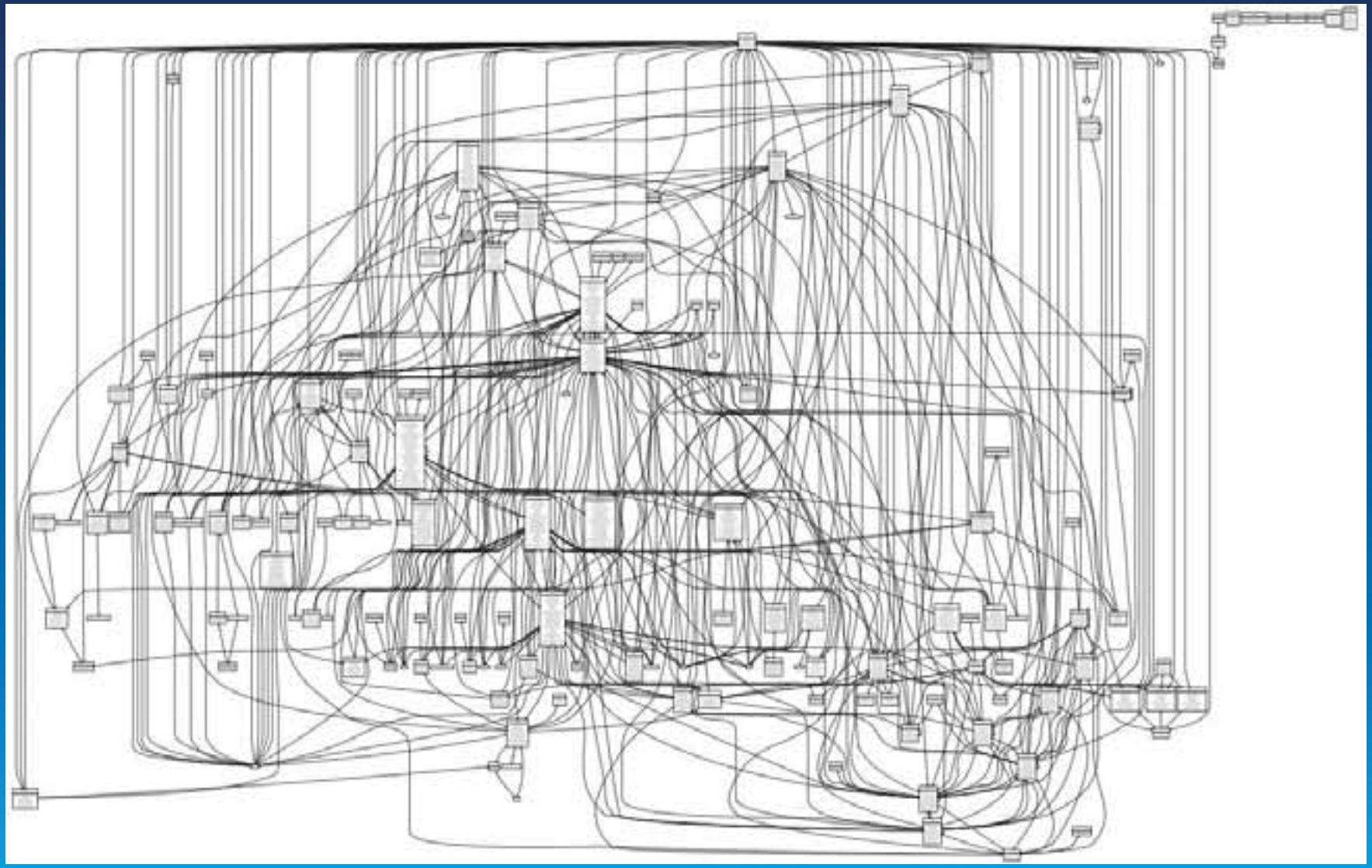


Photo credit Tony Buser
Source: flickr.com

ArcCatalog - C:\data\MotherOfAllGeodatabases_10.gdb\landbase

File Edit View Go Geoprocessing Customize Windows Help

Compress Database Unregister As Versioned Load X

C:\data\MotherOfAllGeodatabases_10.gdb\landbase

Catalog Tree

- AddressLocator
- Schematics
- Annotation
- CadastralFabric
- ctgNDSFDS
- Dimension
- GeometricNetwork
- landbase
- RasterCatalog
- RelationshipClassAttributed
- RelationshipClassComposite
- RelationshipClassCompositeAttributed
- RelationshipClassSimple
- TerrainDataset
- Topology
- GP_Toolbox
- HydrantsS
- ISP_BREAKER
- ISP_CIRCUIT
- ISP_FUSE
- MultiPointFeatureClass
- RasterAttribute
- RasterDataset
- Representations
- Route_Event_Table
- StandAloneFeatureClass
- MotherOfAllGeodatabases_92.gdb
- multipatch.gdb
- test.gdb
- testdata.gdb
- UC_1.gdb
- Toolbox.tbx
- machine_ID.txt
- New_dBASE_Table.dbf

Contents | Preview | Description

Name	Type
address_loc_1	File Geodatabase Feature Class
Anno_31_45	File Geodatabase Relationship Class
Anno_31_45_1	File Geodatabase Relationship Class
Anno_41_46	File Geodatabase Relationship Class
Anno_subtypes_streets	File Geodatabase Feature Class
building	File Geodatabase Feature Class
ctylmtpy	File Geodatabase Feature Class
feature_linked_parcel_anno	File Geodatabase Feature Class
feature_linked_parcel_anno_1	File Geodatabase Feature Class
landuse	File Geodatabase Feature Class
linear_ref_Routes	File Geodatabase Feature Class
multipatch_bldgs	File Geodatabase Feature Class
Parcels	File Geodatabase Feature Class
Potholes	File Geodatabase Feature Class
road_buffer_2	File Geodatabase Feature Class
selected_parcles_1_1	File Geodatabase Feature Class
selected_roads	File Geodatabase Feature Class
sidewalk	File Geodatabase Feature Class
sidewalk_buffer	File Geodatabase Feature Class
signs	File Geodatabase Feature Class
streets	File Geodatabase Feature Class
Streets_geocode	File Geodatabase Feature Class
trans	File Geodatabase Feature Class
Trees	File Geodatabase Feature Class

Photo credits: bmb, aplysia_06, steve.abraham (flickr users)
Source: flickr.com

Getting started…

Violations (table related to inspections via InspectionID Field

- InspectionID, long
- ViolationType, long, subtype field
  - Subtypes:

    0 = Administration

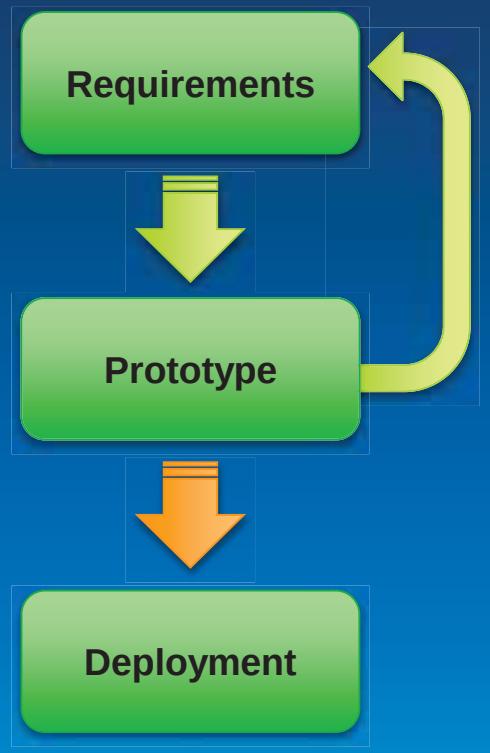
    1= General fire precautions

    2= Fire Service features

    3= Fire protection systems

    4=Means of egress

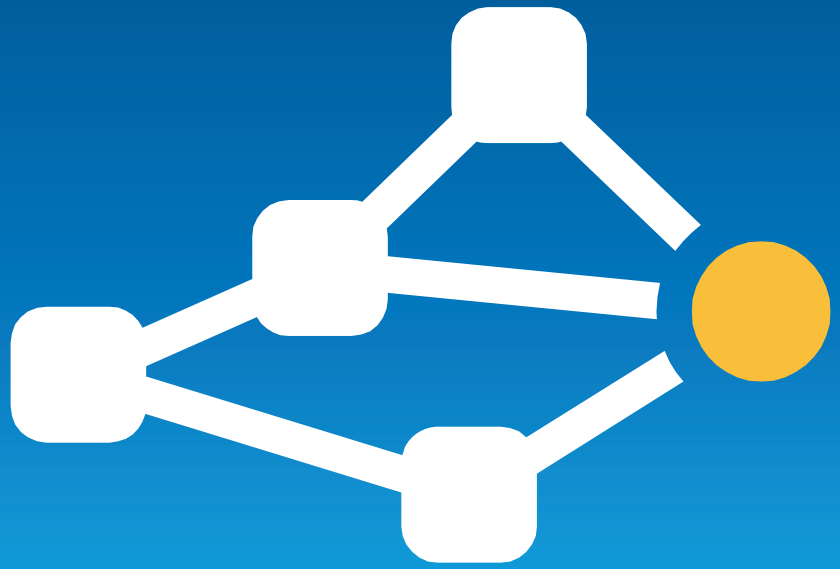
    5= Misc Violations ((Includes: Building services and systems (Fuel fired appliances), Fire resistance rated construction, Interior finish, decorative materials and furnishings))
- Comments
- Enable attachments for photos, videos etc



Model Tools

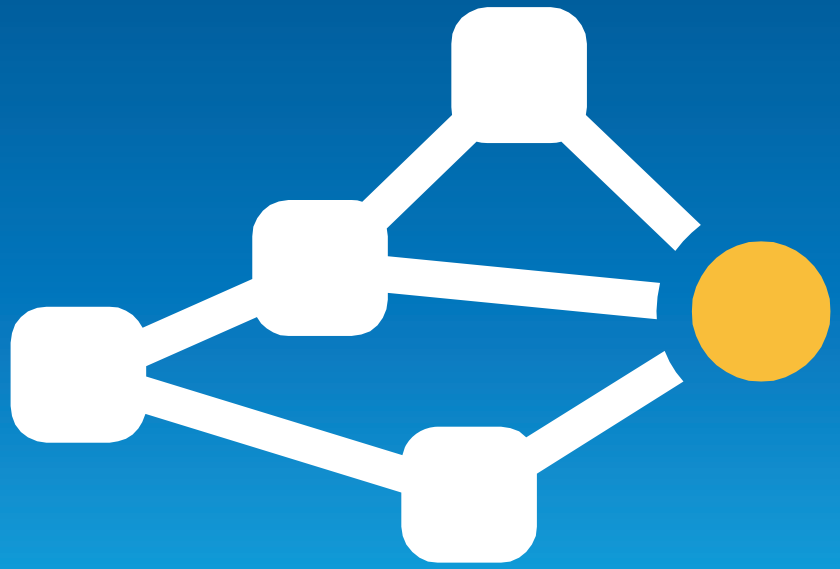
Model tools

- Built in tools = good but limited
- Model tools
  - Implement custom behavior
  - Group of tasks
  - Run like system tools

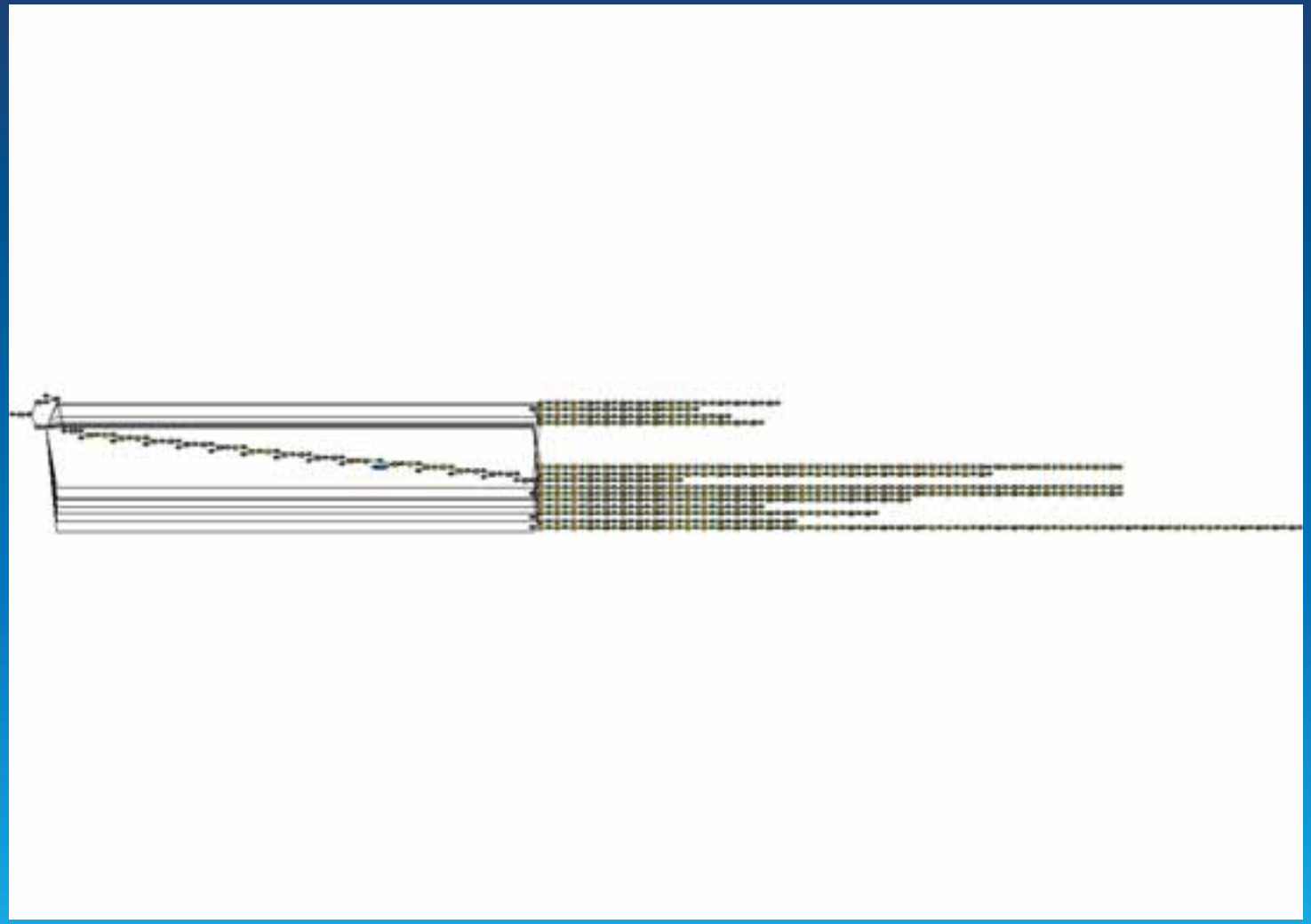


Why create model tools?

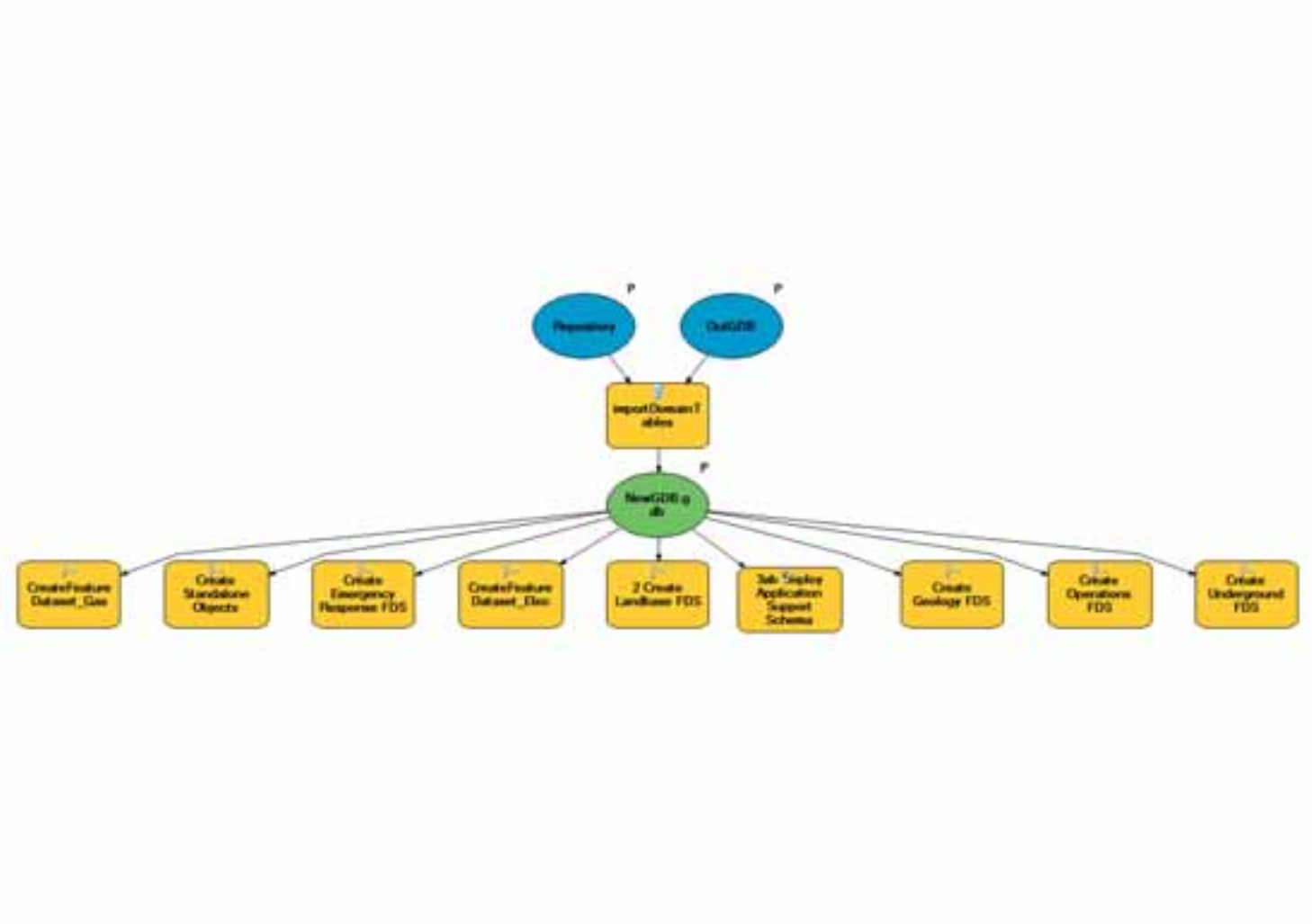
- **Reduce clutter, improve readability**
  - **Fewer tools**
- **Reduce data entry**
  - **Fewer parameters to change**



Growing pains

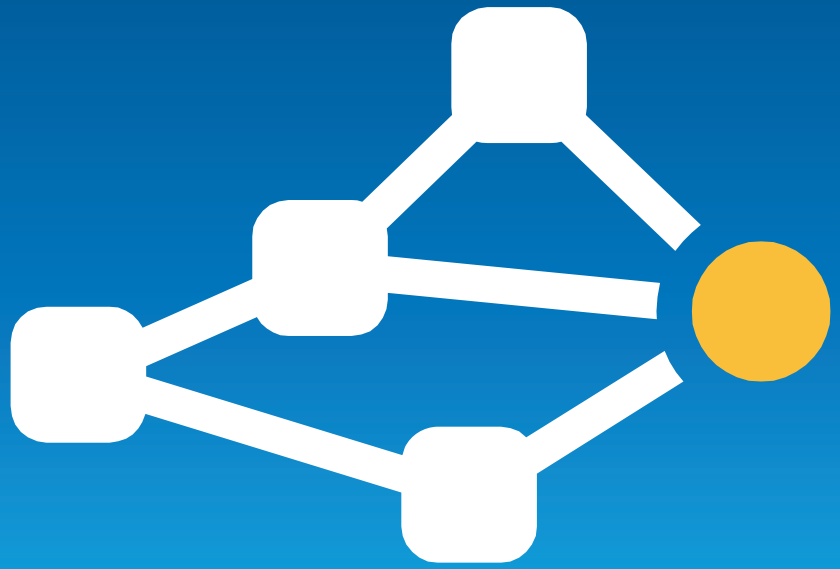


Organizing your tools

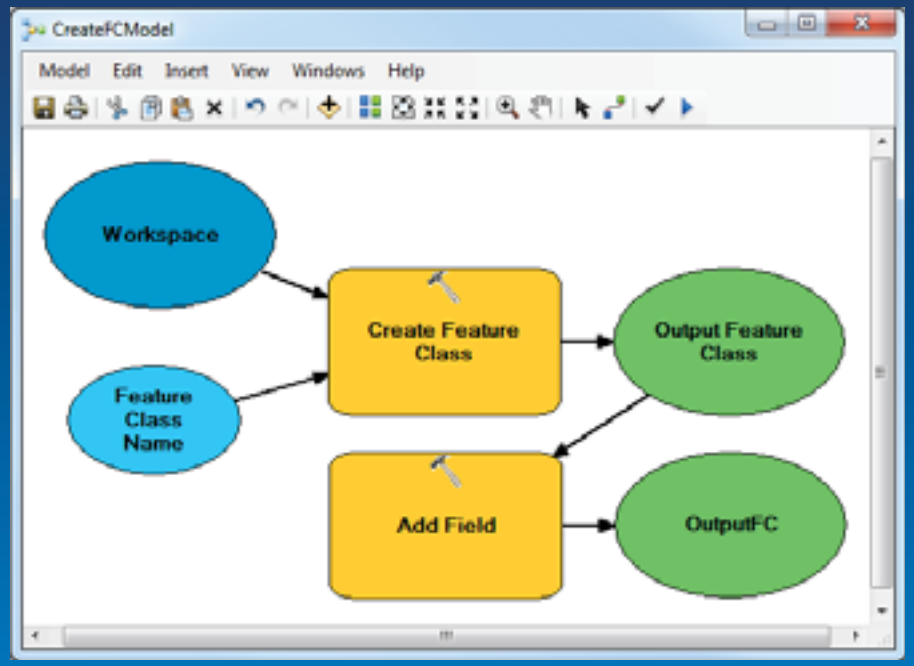


Turning models into model tools

- ‘Model parameter’
  - Allow tools to consume other tools
- Can be any parameter within the tool
- Input and output (derived) parameters



Creating a model tool



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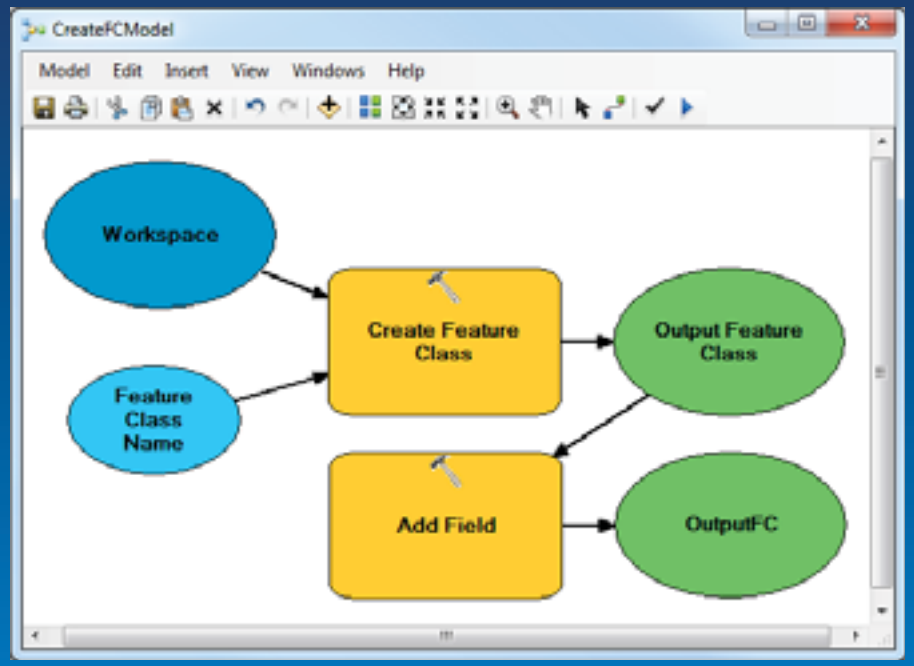

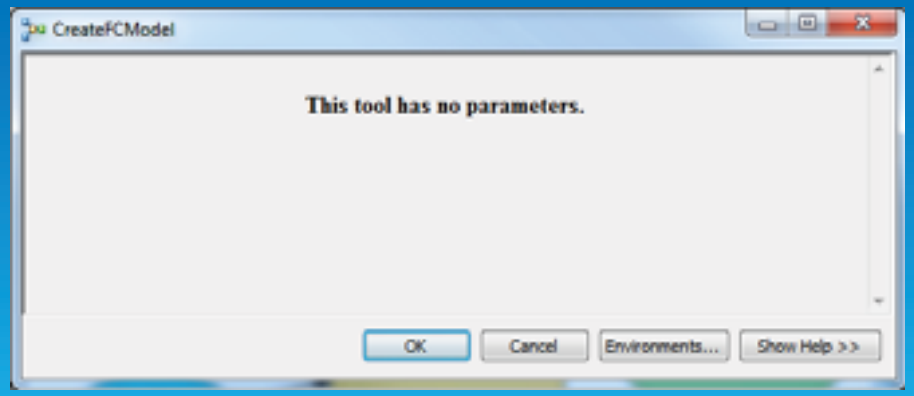

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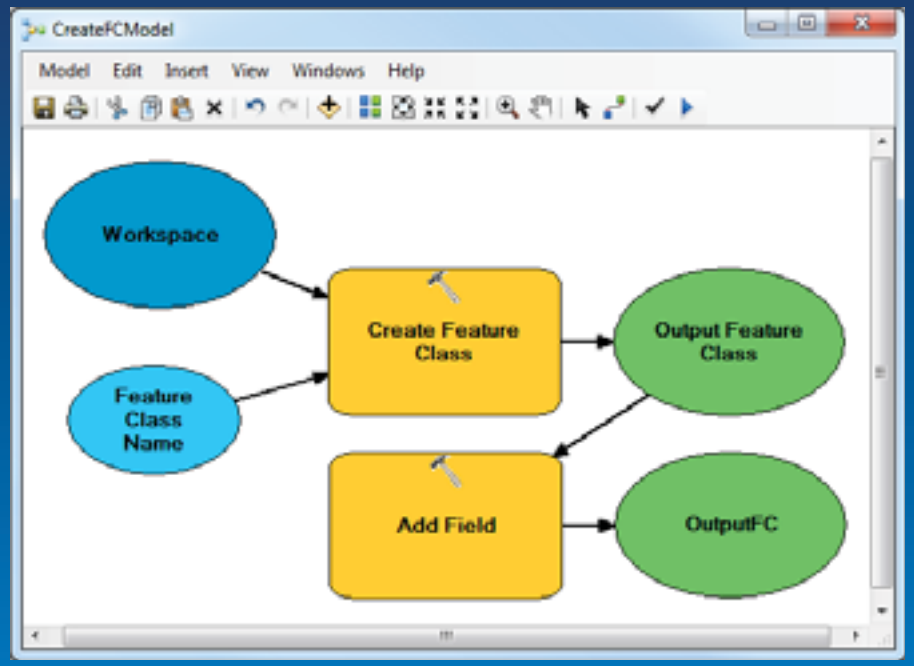

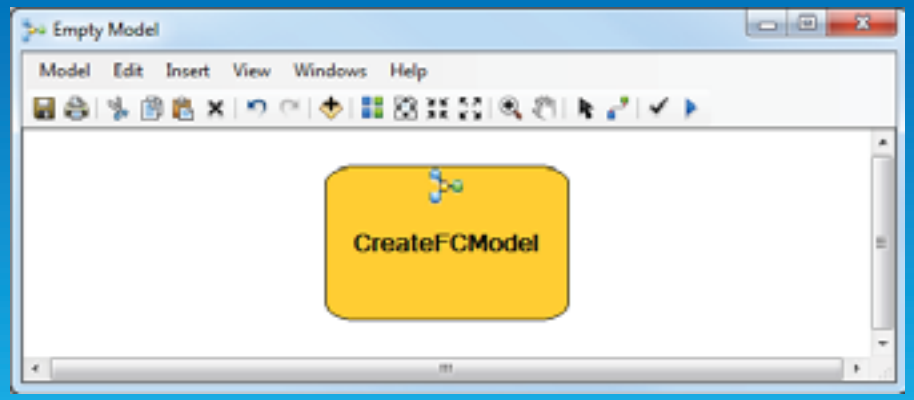

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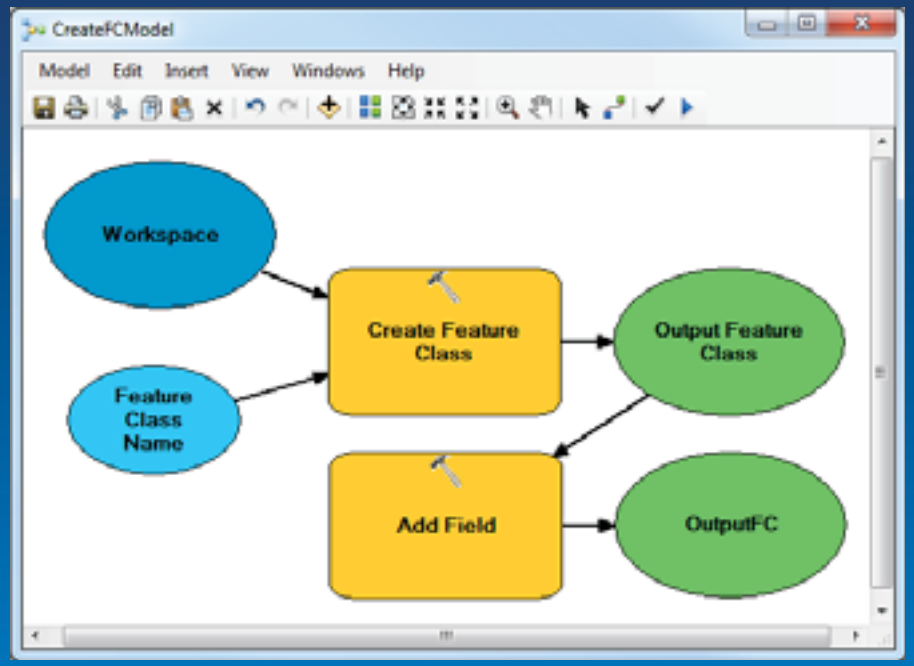

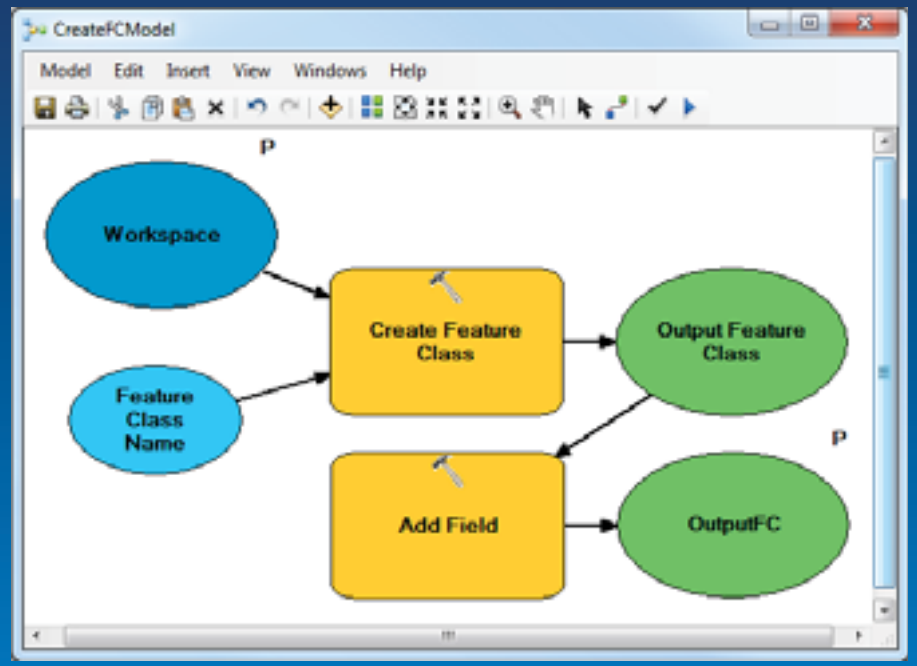

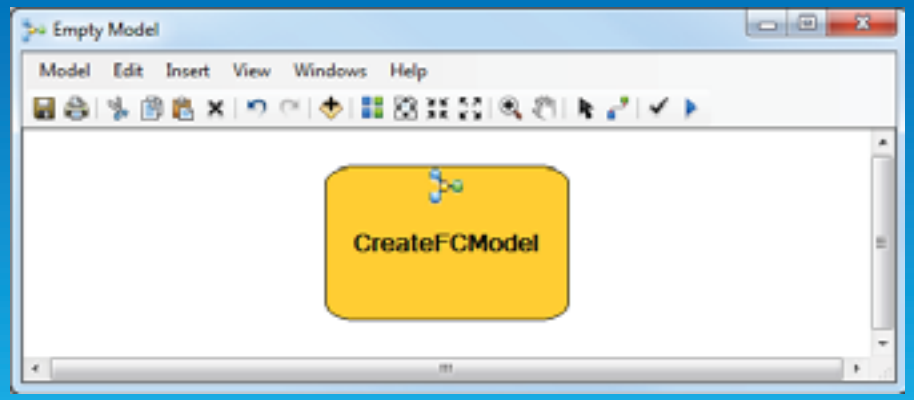

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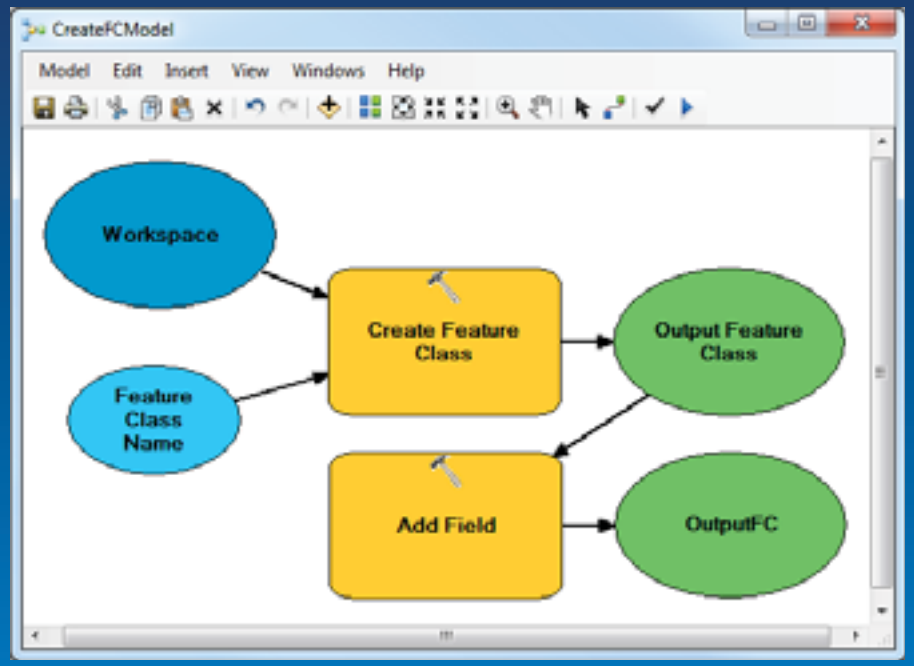

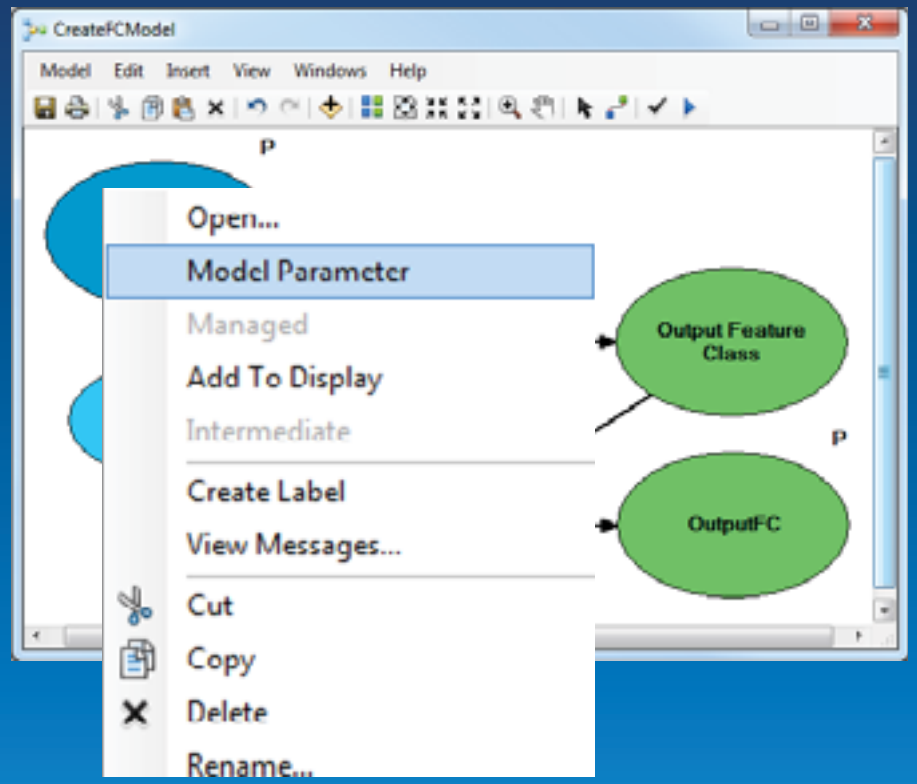

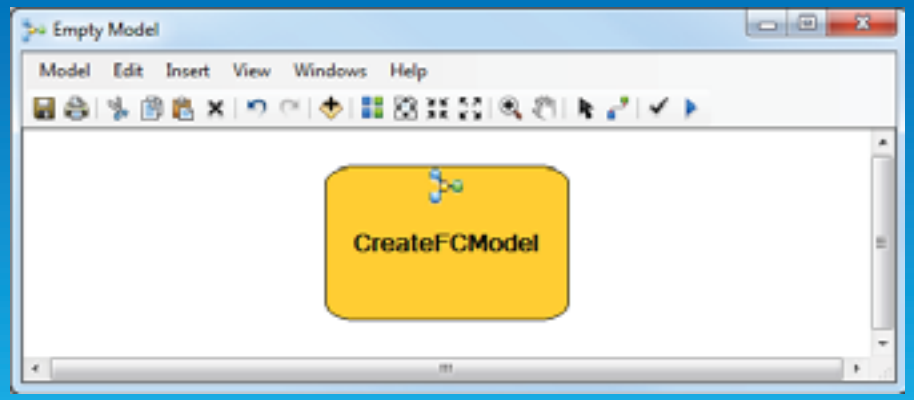

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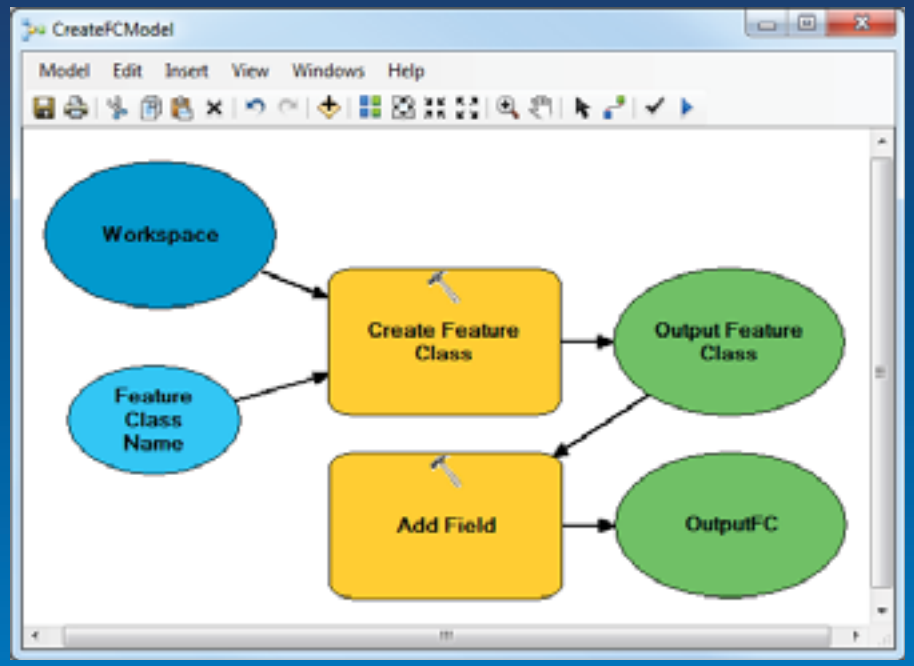

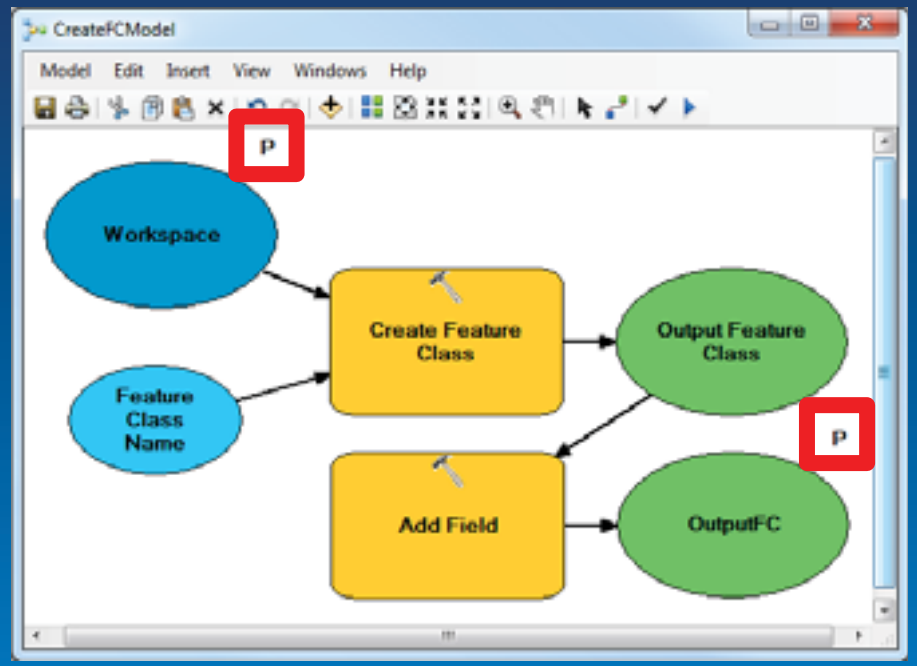

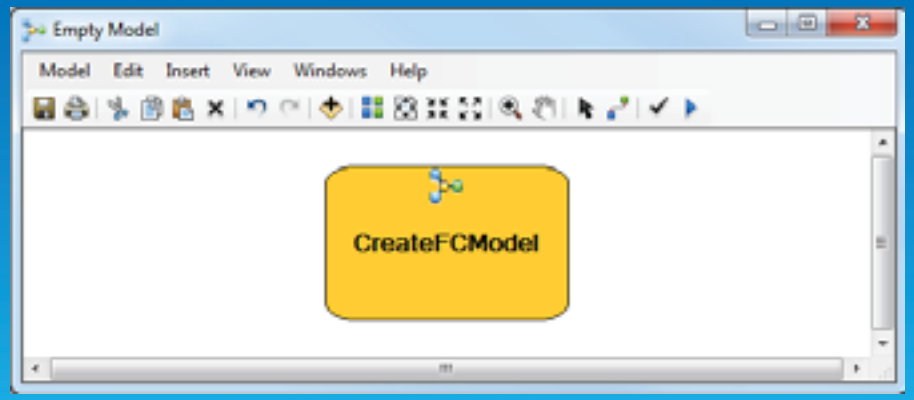

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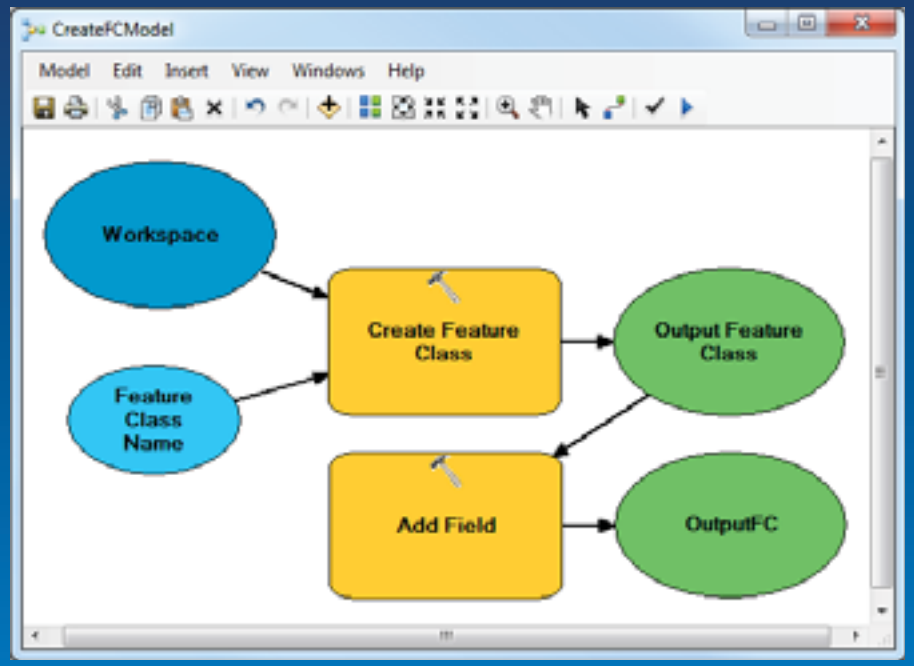

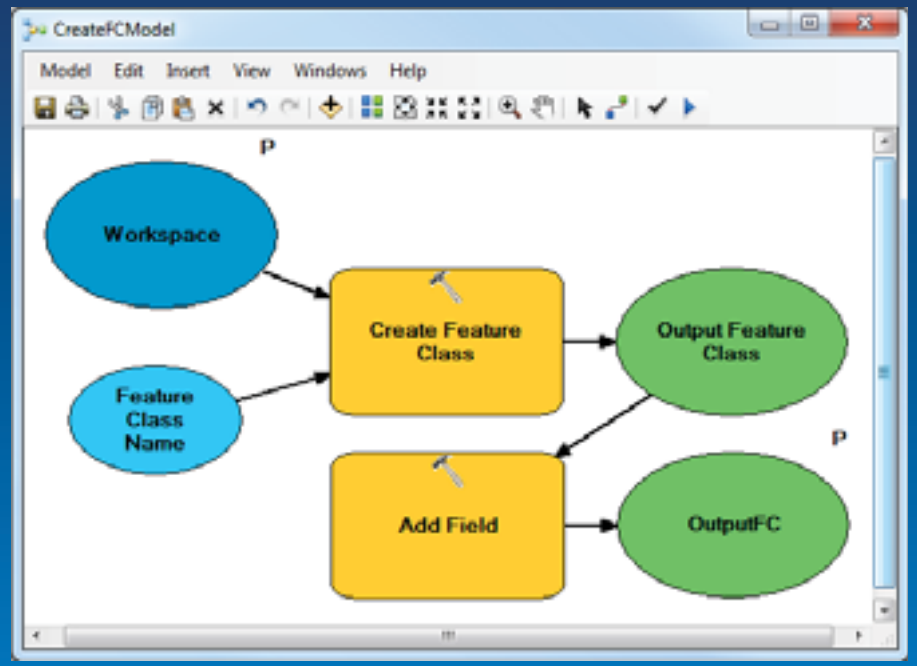

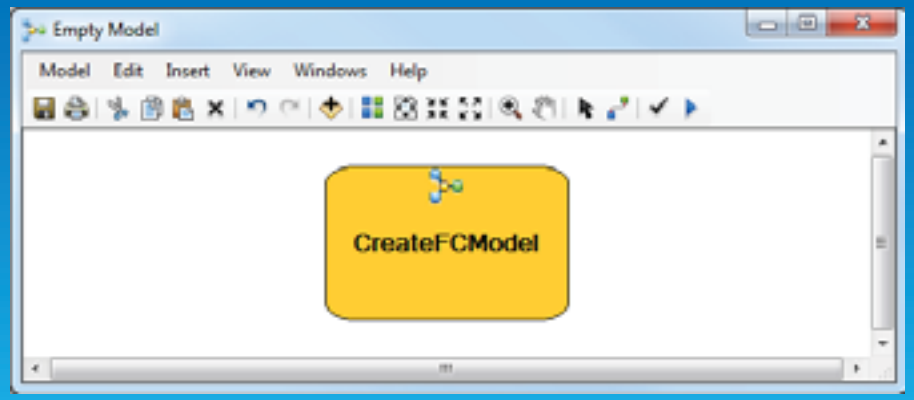

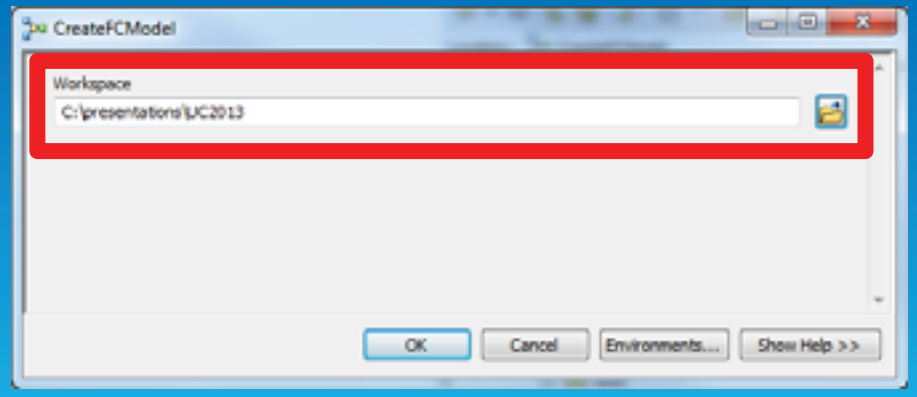

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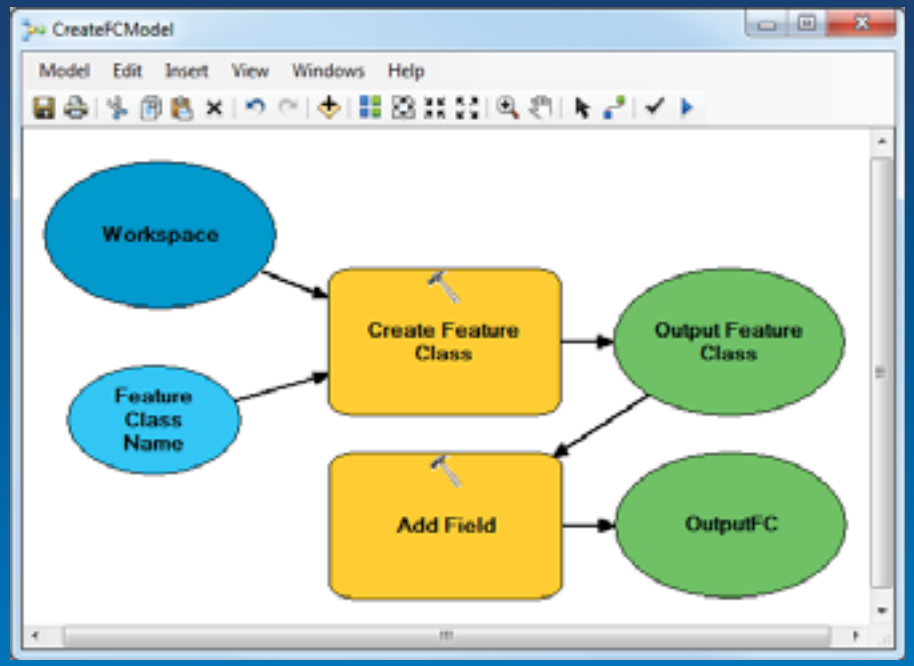
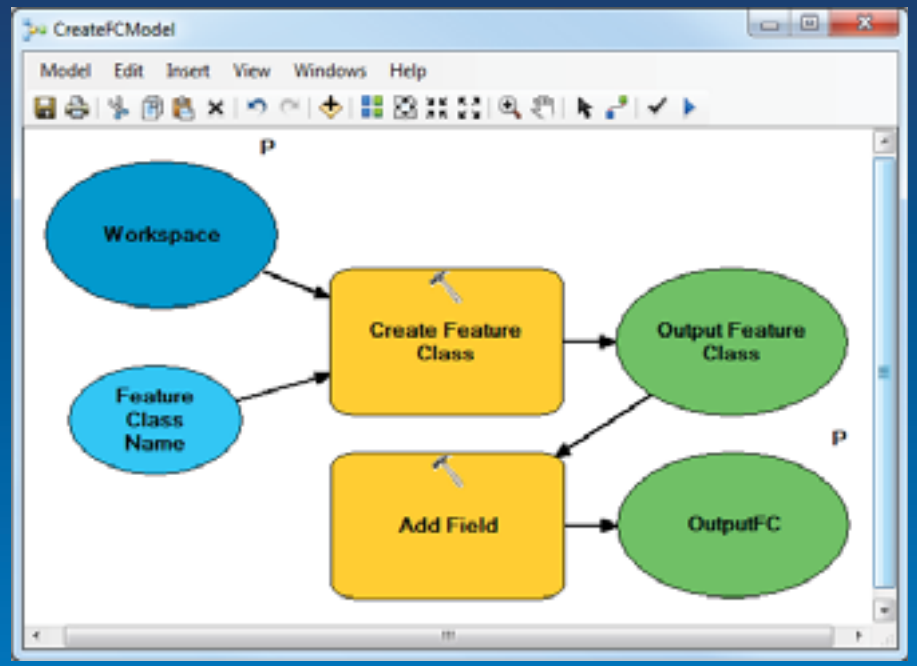
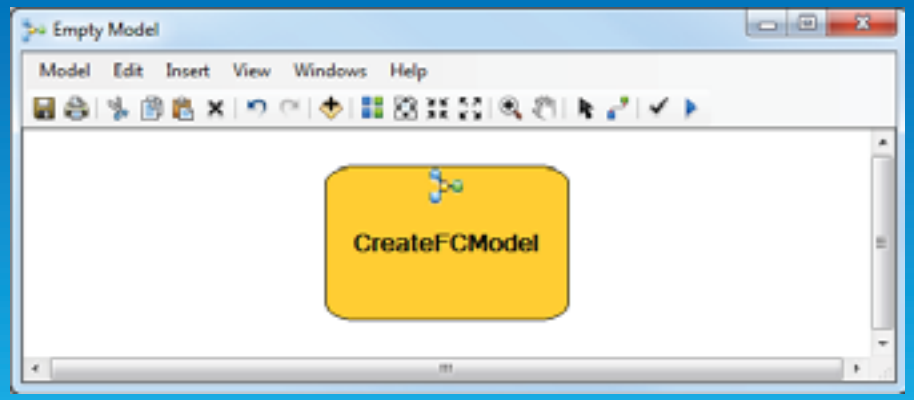
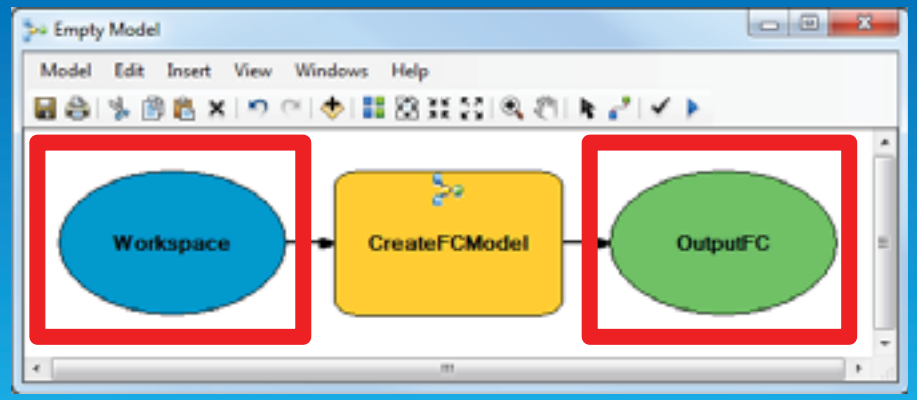






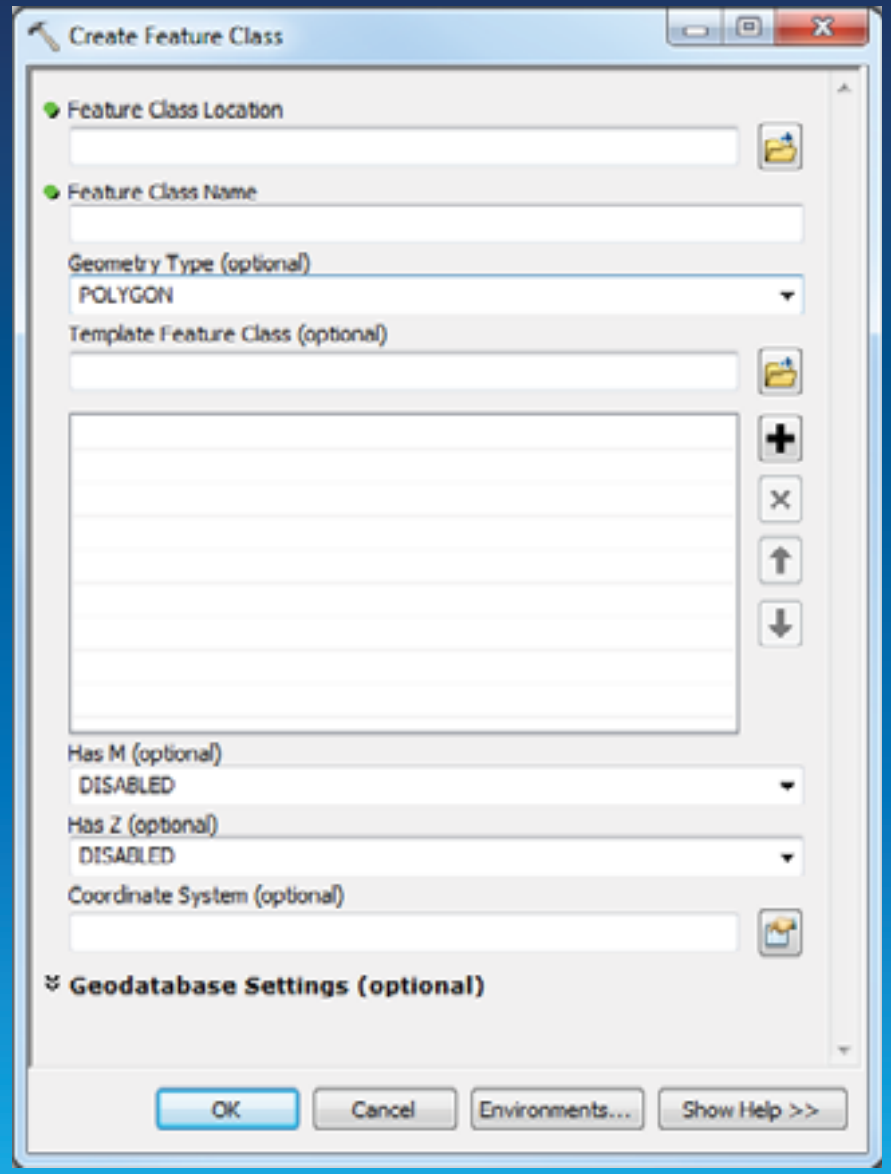


Organizing your models

- Organize your models into logical groups
  - Feature datasets
  - Departments in your organization
  - Applications you are building
  - Domains*
- Makes schema modular

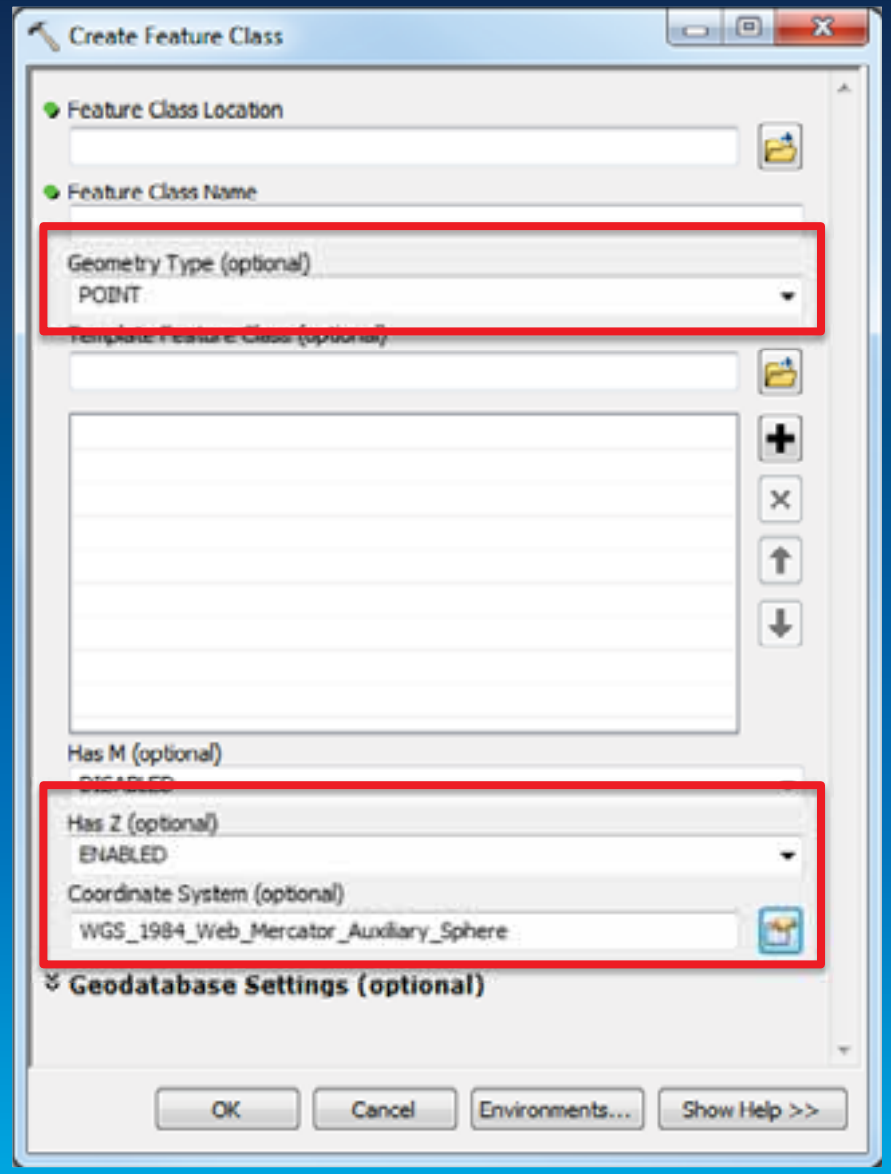
Overriding Default Behavior

Tips and tricks



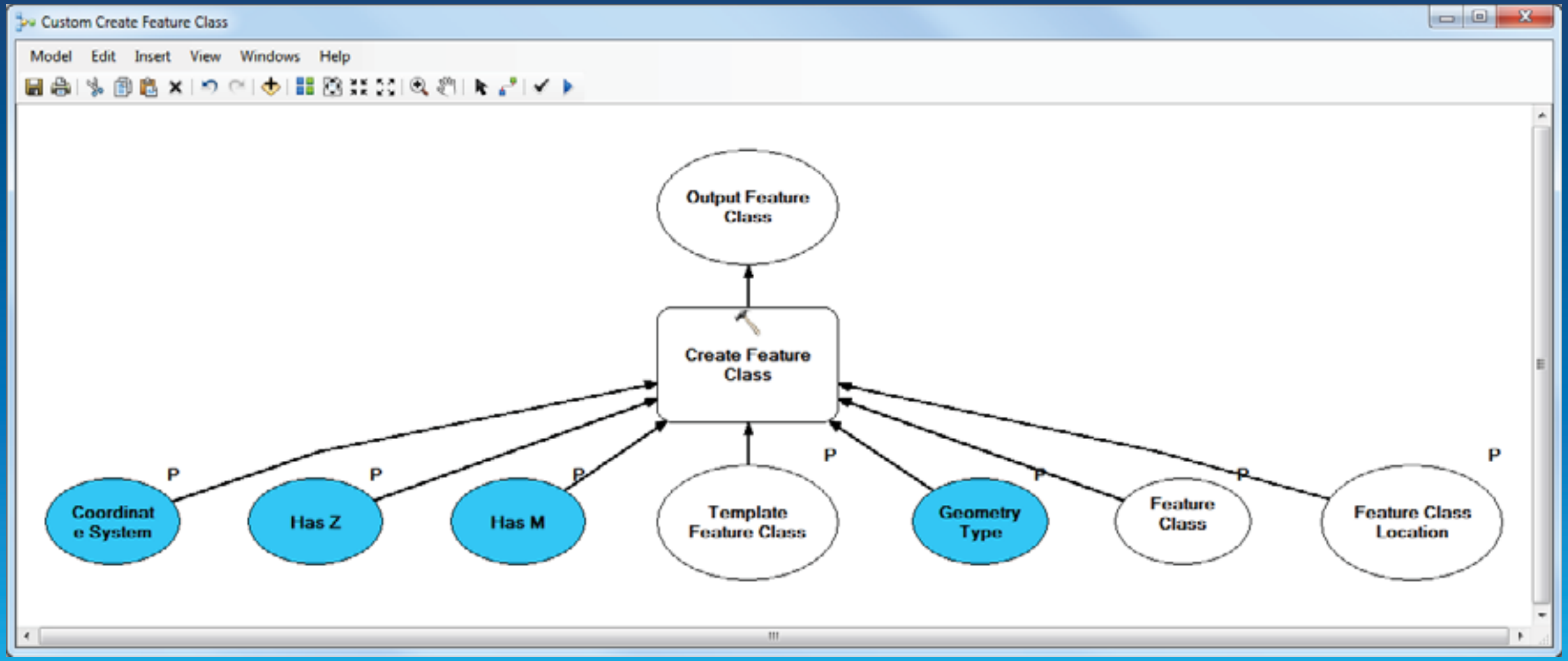
Overriding Default Behavior

Tips and tricks



Overriding Default Behavior

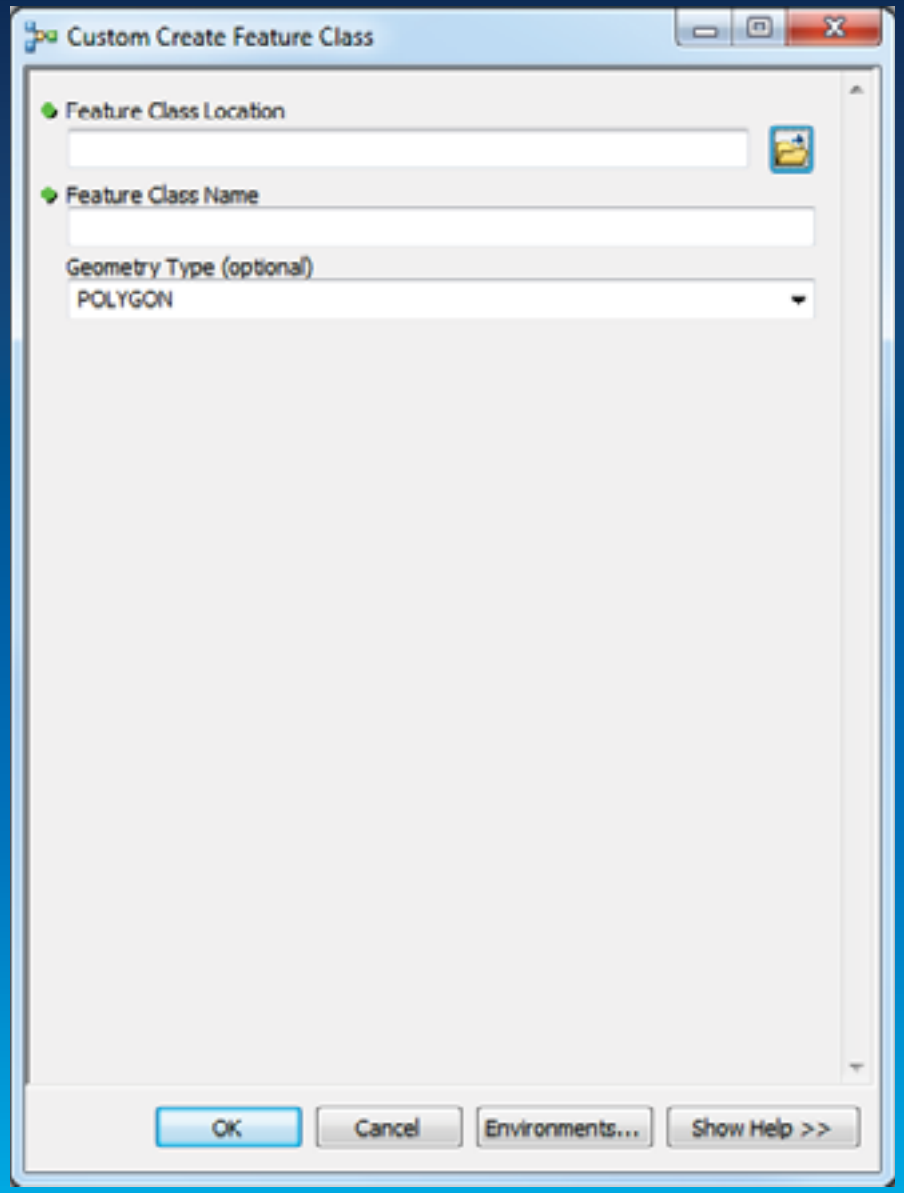
Tips and tricks



Overriding Default Behavior

Tips and tricks

- Geometry type = POINT
- Has Z = ENABLED
- Coordinate System = Web Mercator



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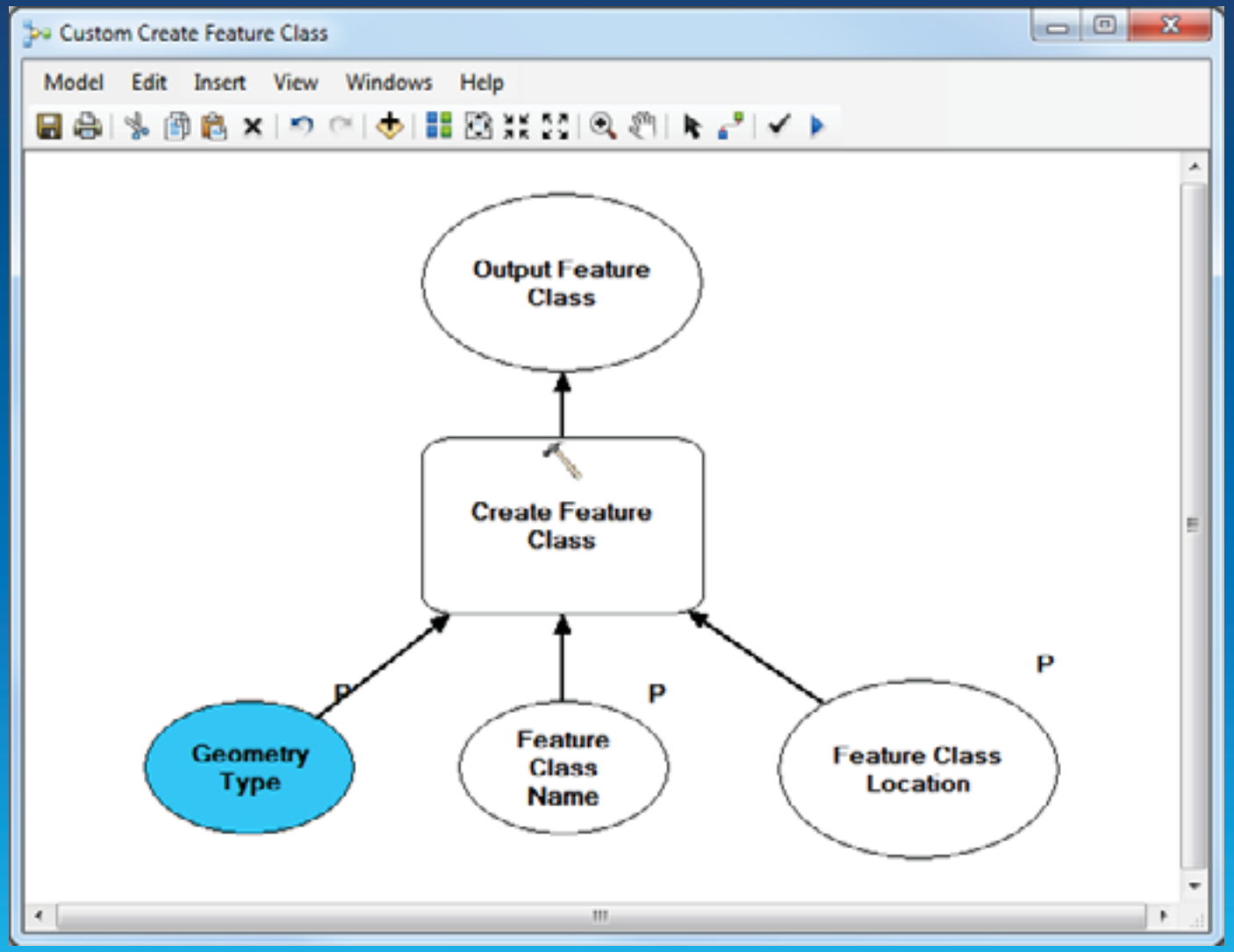

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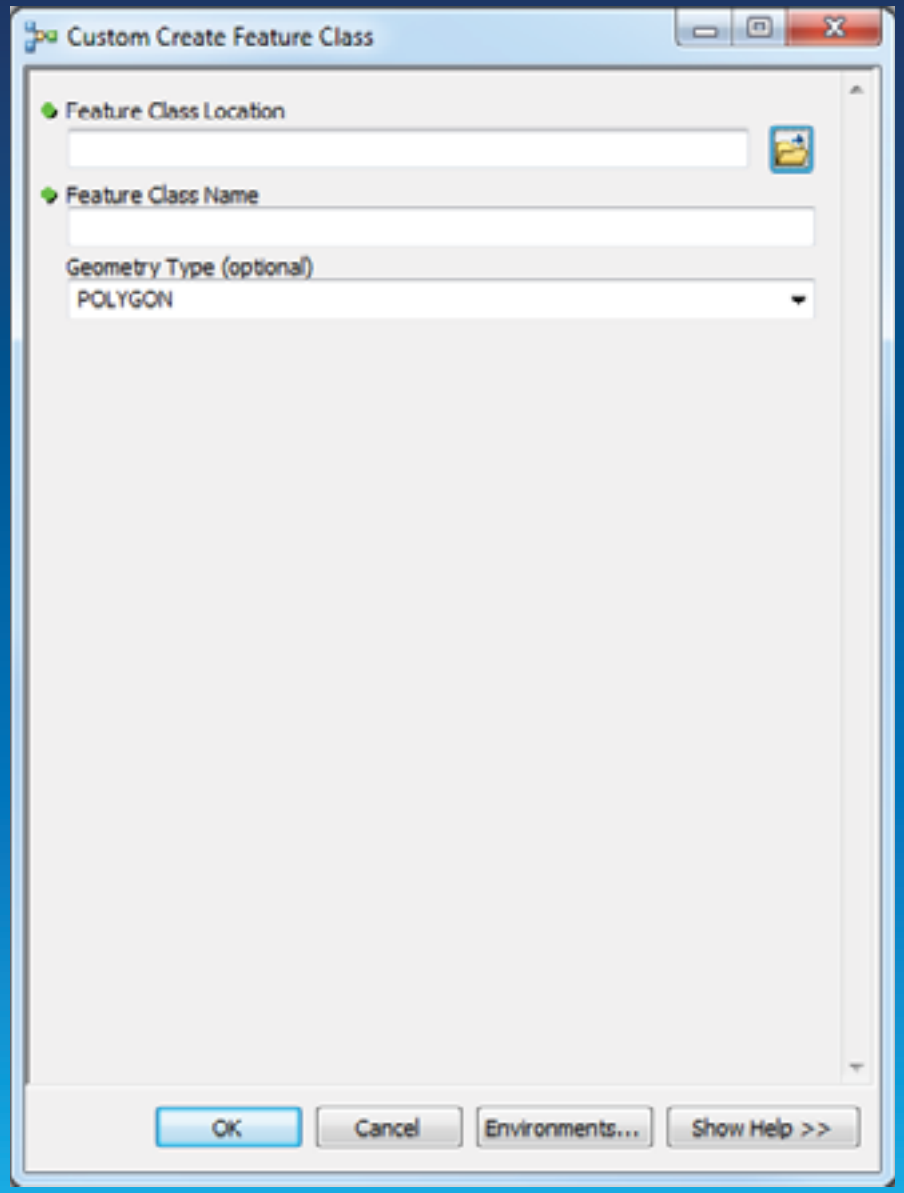


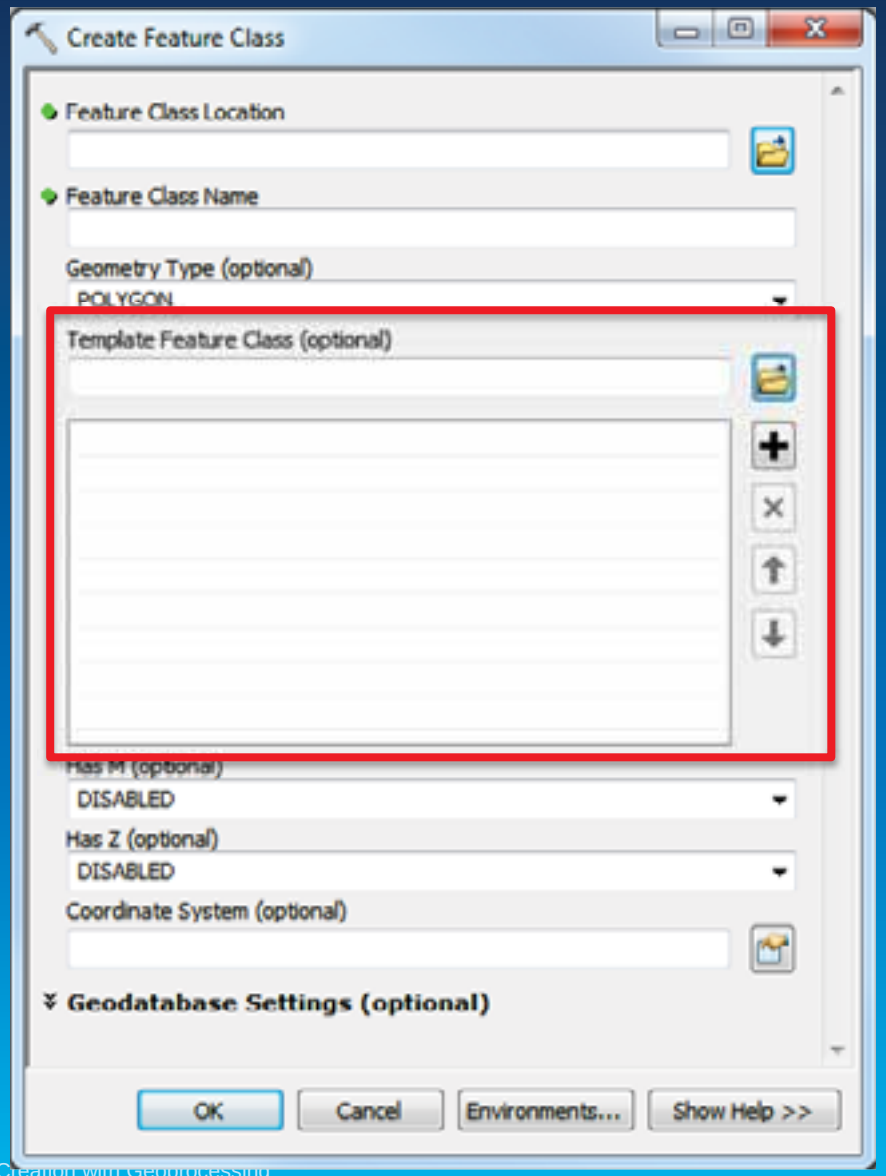
Template Feature Class or Template Table

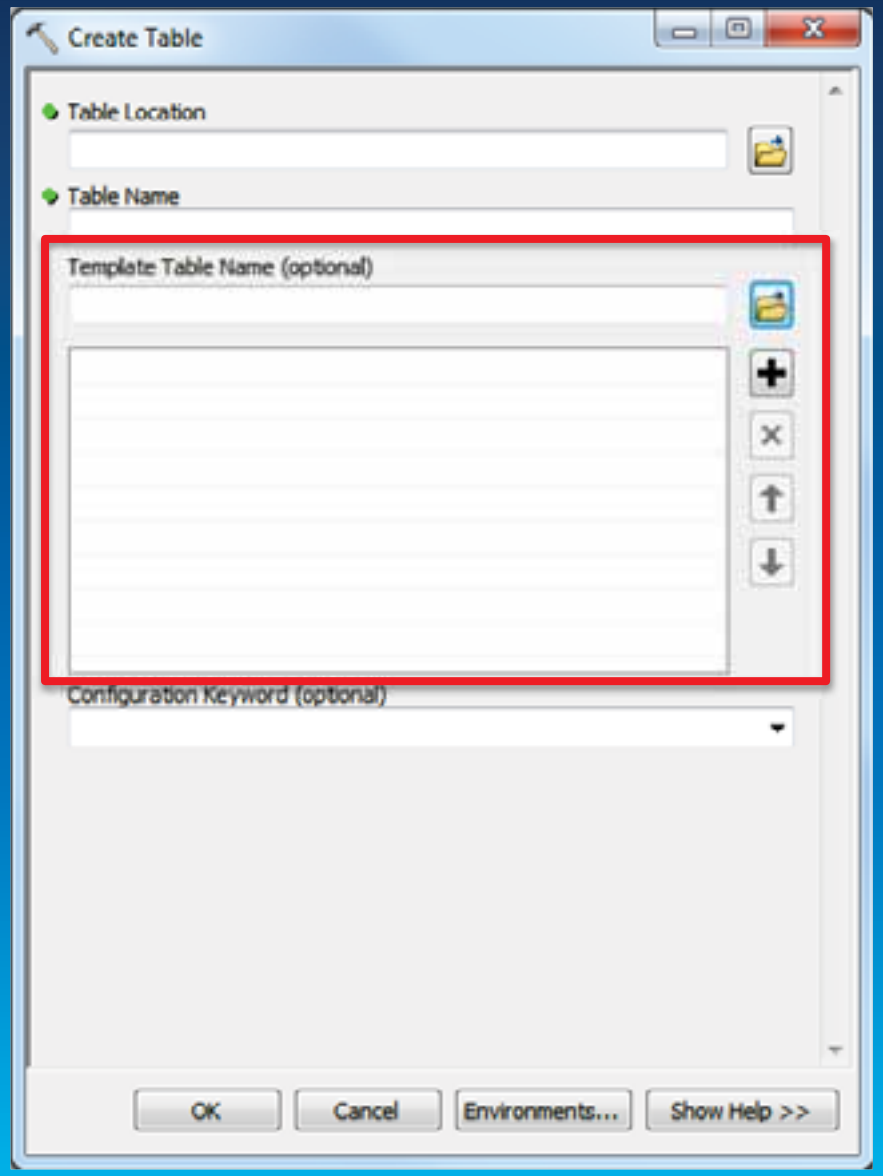
More tips and tricks

- Create feature class and Create table tools
- All template fields will be in the output
- Use when creating the same field/type in multiple tables/feature classes

Template Feature Class or Template Table

More tips and tricks





Demo 2

Schema Creation with Model Tools

Implement data model
Geodatabase behavior
Template Feature Class/Table
Model tools as sub models

Python

Script tools

- Get access to:
  - Programming logic
  - arcpy functions
  - Custom validation

Using Python for Geodatabase creation

- Improving user experience
- Focused functions
- Documentation
  - Reports

Reporting

- arcpy.List… , arcpy.Describe
- Examine contents of geodatabase
- Get information that is not reported through UI
  - Not easily returned from UI

Using a table to run a tool

- **Look for:**
  - **Redundant info**
  - **Tools running multiple times**
- **Use cursors to loop through a table to get parameters.**

Demo 3

Python

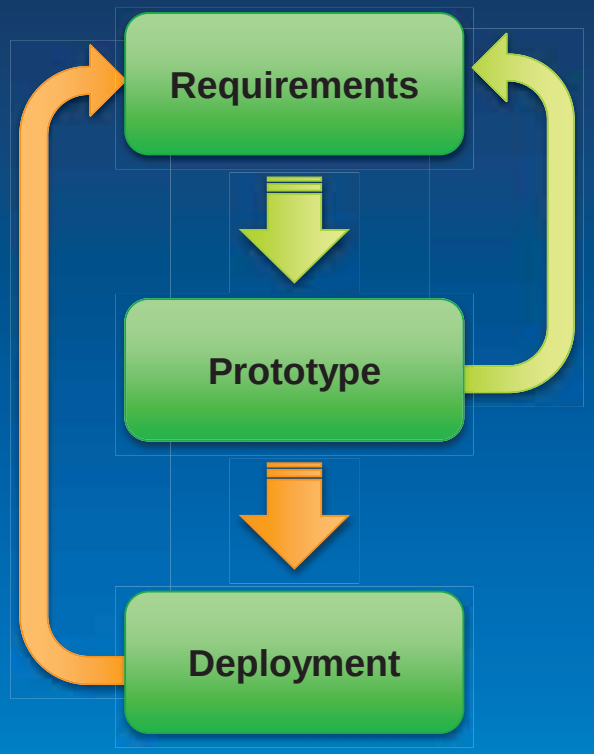
Table to fields
Reporting

Schema Changes

Data Modification

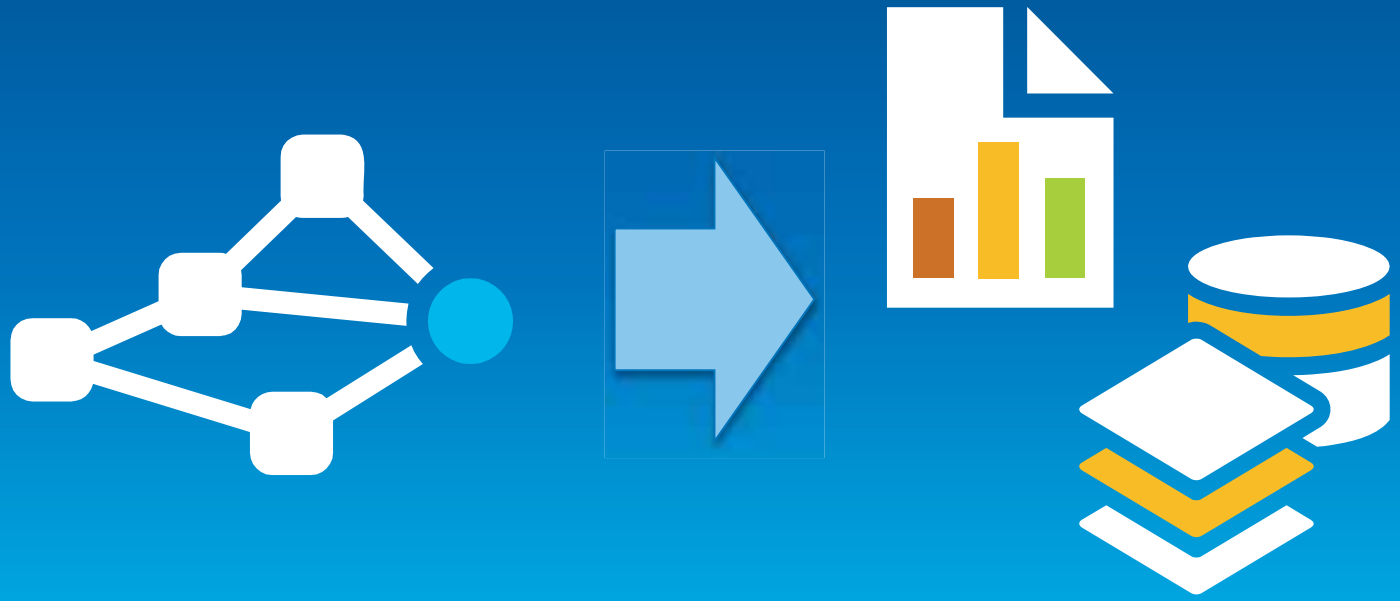
Schema Changes

- Over time your data model <u>will</u> change.
- Use additional models or scripts to push out updates.
- Deploy when appropriate.

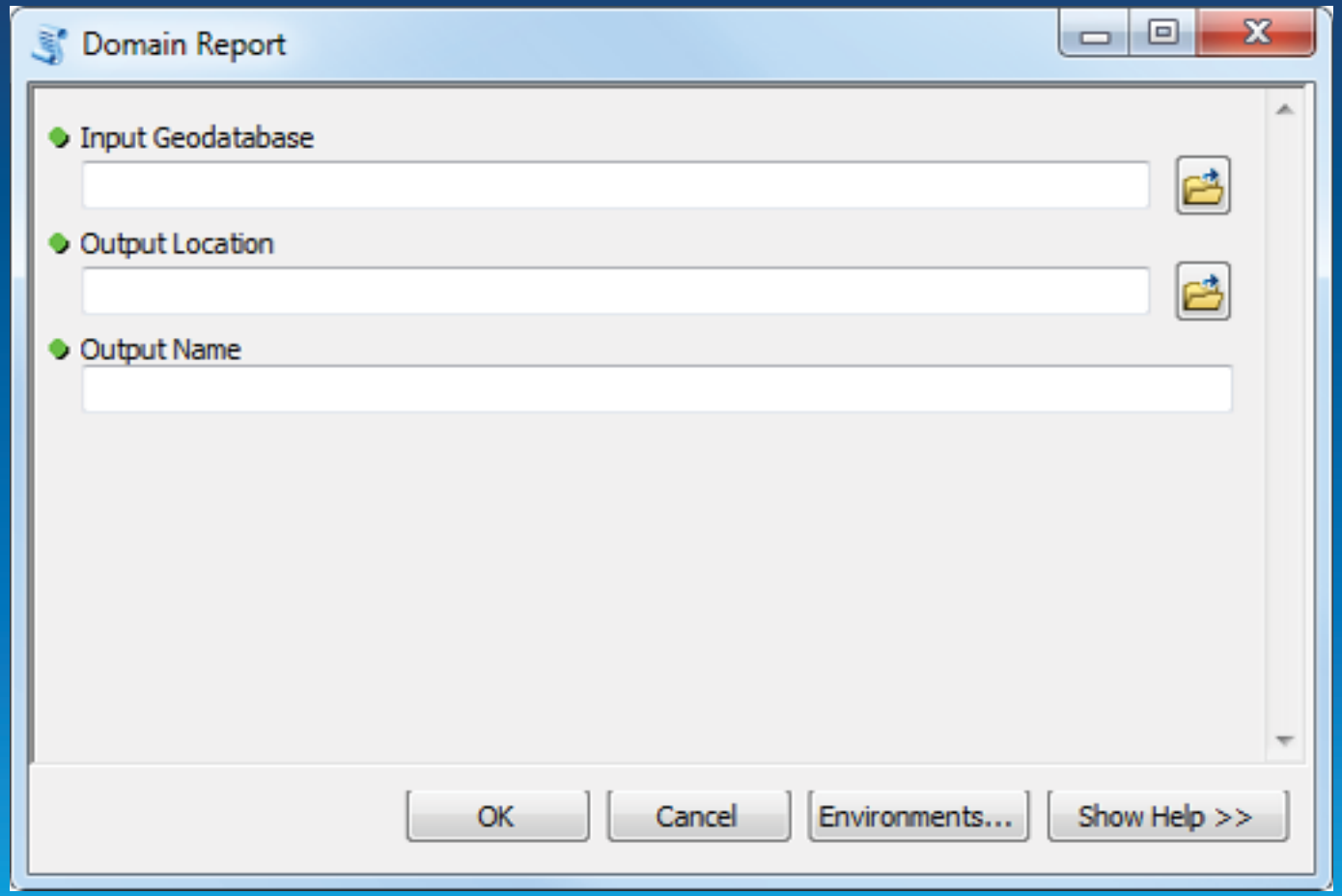


Schema Changes

- Change documentation
- No recreating schema or reloading data
- Schedule changes via simple scripts
- Report on dependencies



Domain Report Tool



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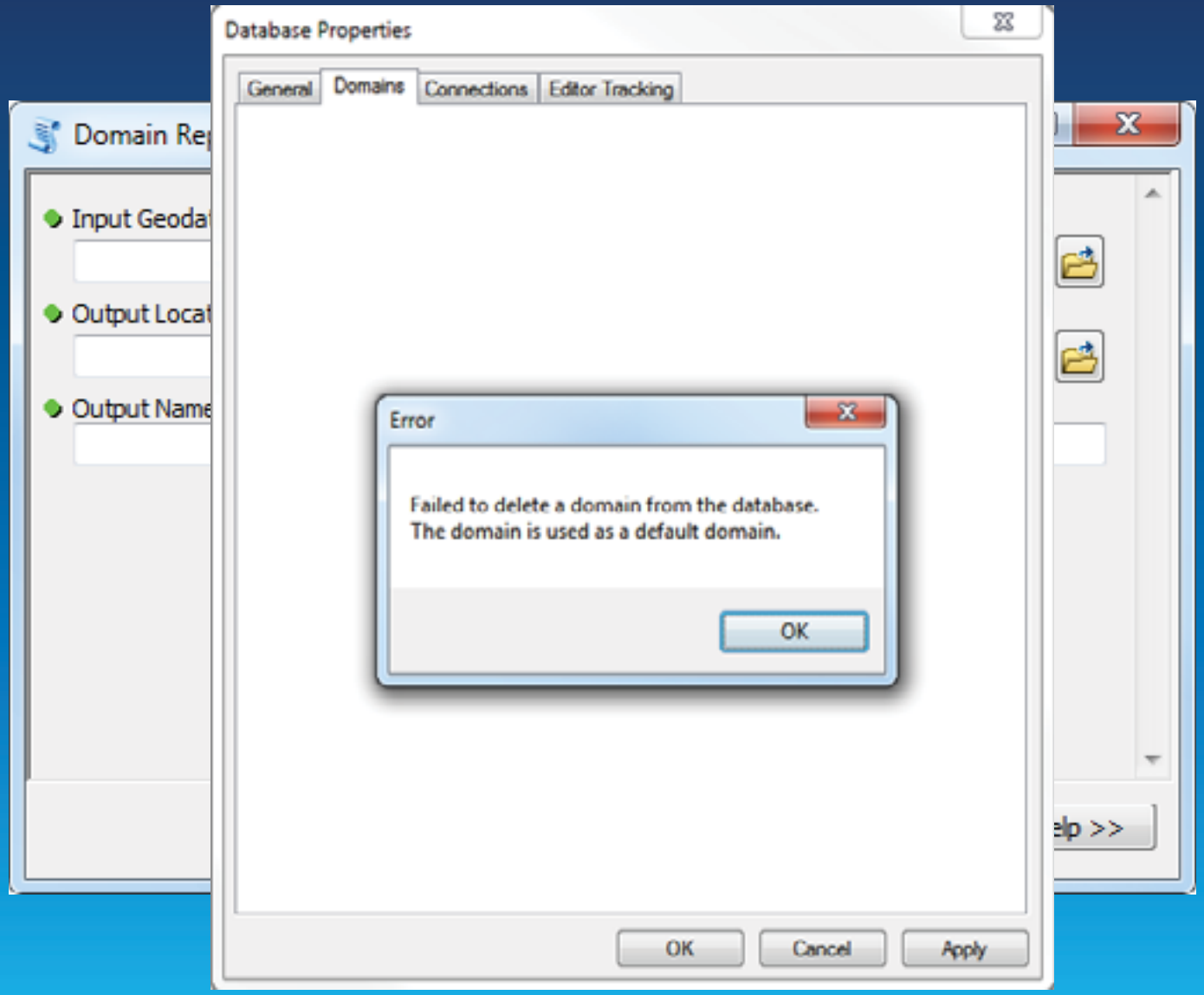


```python
#-------------------------------------------------------------------------------
# Name:        Domain Report
#
#-------------------------------------------------------------------------------

import arcpy, os

# get parameters from the tool
ingdb = arcpy.GetParameterAsText(0)
outputDir = arcpy.GetParameterAsText(1)
outputName =  arcpy.GetParameterAsText(2)

textFile = (outputDir + os.sep + outputName + ".csv")
f = open(textFile, "a")
f.write("FeatureClass" + "," + "FieldName" + "," + "FieldDomain" + "\n")   #write headers

# get a list all Feature Classes in a geodatabase, including inside Feature Datasets
arcpy.env.workspace = gdb
fcs = []
for fds in arcpy.ListDatasets('','feature') + ['']:
    for fc in arcpy.ListFeatureClasses('','',fds):
        fcs.append(os.path.join(fds, fc))

# based on the list of feature classes collected above, this will create a list of fields
# and the write out the feature class, field name and domain name.
for fc in fcs:
    fields = arcpy.ListFields(fc)
    for field in fields:
        # check to see if there is a value in the domain property, basically if string != "":
        if field.domain:
            f.write(fc + "," + field.name + "," + field.domain + "\n")
            arcpy.AddMessage("FC={0} FieldName={1} Domain={2}".format(fc,field.name,field.domain))
f.close()
```

DomainReport.csv - Excel

FILE HOME INSERT PAGE LAYOUT FORMULAS DATA REVIEW VIEW ADD-INS Team

A54

	A	B	C
1	FeatureClass	FieldName	FieldDomain
47	landbase\feature_linked_parcel_anno_1	HorizontalAlignment	HorizontalAlignment
48	GeometricNetwork\Prime_1	Enabled	EnabledDomain
49	GeometricNetwork\Secondary_1	Enabled	EnabledDomain
50	GeometricNetwork\bridging_1	Enabled	EnabledDomain
51	GeometricNetwork\circuit_bkr_1	Enabled	EnabledDomain
52	GeometricNetwork\circuit_bkr_1	AncillaryRole	AncillaryRoleDomain
53	GeometricNetwork\StreetLights_1	Enabled	EnabledDomain
54	GeometricNetwork\StreetLights_1	Status	StreetlightStatus
55	GeometricNetwork\StreetLights_1	Inspector	Employee
56	GeometricNetwork\meters_1	Enabled	EnabledDomain
57	GeometricNetwork\switch_1	Enabled	EnabledDomain
58	GeometricNetwork\switch_1	Status	SwitchStatus
59	GeometricNetwork\transformers_1	Enabled	EnabledDomain
60	GeometricNetwork\Tapwire_1	Enabled	EnabledDomain
61	GeometricNetwork\Electric_Net_1_Junctions	Enabled	EnabledDomain
62	GeometricNetwork\Redline_Line_1	INSPECTOR	Employee
63	GeometricNetwork\Redline_Line_1	COMMENTS	StreetlightStatus
64	GeometricNetwork\WorkRequest_1	Work_Type	WorkType
65	GeometricNetwork\WorkRequest_1	Employee	Employee
66	Topology\Parcels_1	Inspector	Employee
67	Topology\Parcels_1	Comments	WeedAbatement
68	Topology\selected_parcles_1_1_1	Inspector	Employee
69	Topology\selected_parcles_1_1_1	Comments	WeedAbatement
70	Topology\address_loc_1_1	Inspector	Employee
71	Topology\address_loc_1_1	Comments	WeedAbatement
72	RelationshipClassAttributed\bapOriginFCA	LandUse	LandUse
73	RelationshipClassSimple\bapSimpleOriginFC	LandUse	LandUse
74	RelationshipClassComposite\bapCompositeOriginFC	LandUse	LandUse
75	RelationshipClassComposite\bapAOriginFCC	LandUse	LandUse
76	ctgNDSFDS\ctgNDSAnno	Status	AnnotationStatus
77	ctgNDSFDS\ctgNDSAnno	Bold	BooleanSymbolValue
78	ctgNDSFDS\ctgNDSAnno	Italic	BooleanSymbolValue
79	ctgNDSFDS\ctgNDSAnno	Underline	BooleanSymbolValue
80	ctgNDSFDS\ctgNDSAnno	VerticalAlignment	VerticalAlignment
81	ctgNDSFDS\ctgNDSAnno	HorizontalAlignment	HorizontalAlignment
82	ctgNDSFDS\ctgCEFGN_NG	Enabled	EnabledDomain
83	ctgNDSFDS\ctgNDSFDS_Net_Junctions	Enabled	EnabledDomain
84	Representations	Inspector	Employee
85	Representations	Comments	WeedAbatement
86	Representations	RuleID	Representations_Rep_Rules
87	Representations	RuleID_1	Representations_Rep1_Rules

DomainReport.xls

READY 100%

DomainReport.csv - Excel

FeatureClass	FieldName	FieldDomain
Annotation\Notes_Anno	UserName	Employee
Annotation\Notes_Line	UserName	Employee
Annotation\Notes_Points	UserName	Employee
Annotation\Notes_Poly	UserName	Employee
landbase\Parcels	Inspector	Employee
landbase\Potholes	Inspector	Employee
landbase\address_loc_1	Inspector	Employee
landbase\selected_parcles_1_1	Inspector	Employee
GeometricNetwork\StreetLights_1	Inspector	Employee
GeometricNetwork\Redline_Line_1	INSPECTOR	Employee
GeometricNetwork\WorkRequest_1	Employee	Employee
Topology\Parcels_1	Inspector	Employee
Topology\selected_parcles_1_1_1	Inspector	Employee
Topology\address_loc_1_1	Inspector	Employee
Representations	Inspector	Employee

DomainReport.xls

READY 15 OF 86 RECORDS FOUND

Scheduling

- Important to reduce downtime.
- Simple to schedule using OS scheduler

Inline Variables in ModelBuilder

Tips and Tricks

- Use the contents of one variable as a substitute for another variable
- Enclose the substituting variable in percent signs (%)
  - Eg: %Input Workspace%
- Dynamic
  - For schema creation they are essentially relative paths
- Example:
  - %InputWorkspace%\Street Centerlines
  - Gets evaluated as \\Database Connections\LandUse_Ian.sde\StreetCenterlines

Demo 4

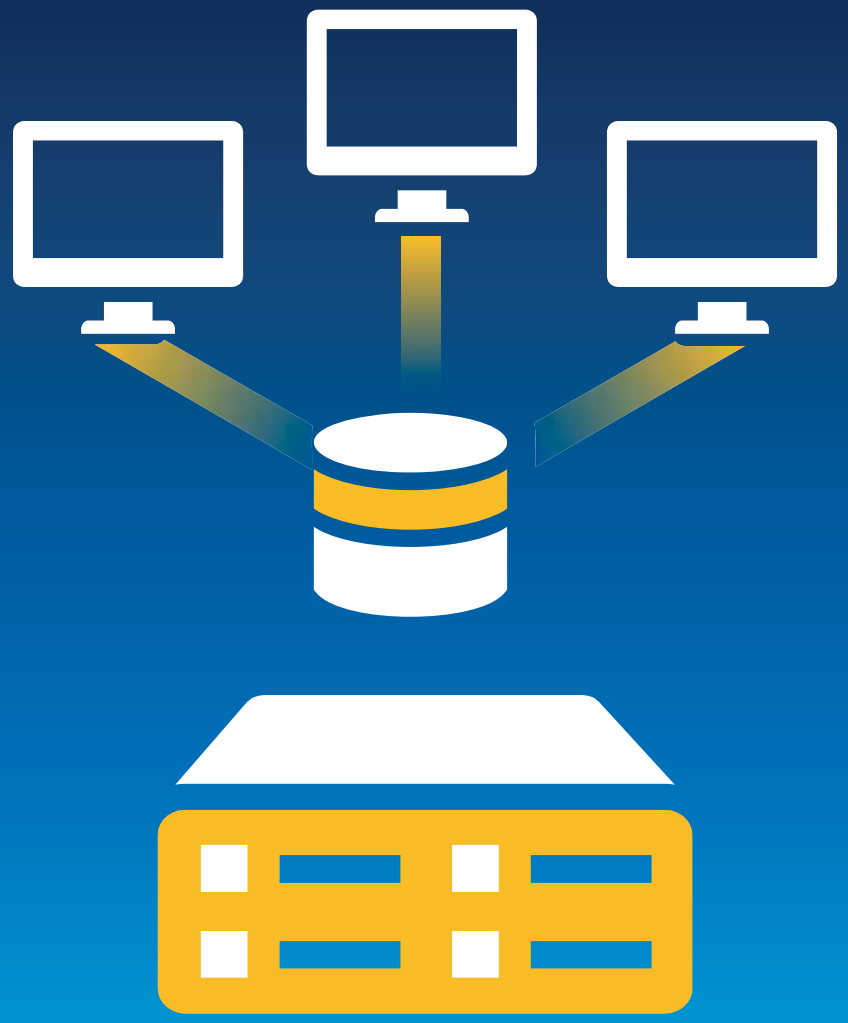
Modifying Geodatabase

Inline variables
Scripting models
Schedule changes

Enterprise Geodatabases

Considerations for enterprise

- Creating Users
- Creating Roles
- Assigning Privileges
- Managing Versions
- Registering data as versioned
- Replicas



Limitations

- Create Network Datasets
- Create Parcel Fabrics
- Create Annotation
- Create Schematic Dataset

Final Thoughts

- Use model tools and python
- Make schema changes easily
- Use Python to report
- Geoprocessing creates full featured geodatabases

Other Sessions - Geoprocessing

- ModelBuilder: Branching, Iterating, and Other Advanced Methods
  - Tuesday, 15 Jul 2014, 1:30pm - 2:45pm
    - Location: Room 04
  - Wednesday, 16 Jul 2014, 3:15pm - 4:30pm
    - Location: Room 03
- Python: Building Geoprocessing Tools
  - Tuesday, 15 Jul 2014, 3:15pm - 4:30pm
    - Location: Room 05 B
  - Wednesday, 16 Jul 2014, 10:15am - 11:30am
    - Location: Room 05 B
- ModelBuilder: Tips and Tricks
  - Wednesday, 16 Jul 2014, 10:30am - 11:00am
    - Location: Demo Theater - Analysis and Geoprocessing Exhibit Hall B

Other Sessions - Geodatabase

- Geodatabase Administration: An Introduction
  - Tuesday, 15 Jul 2014, 1:30pm - 2:45pm
    - Location: Room 07 A/B
  - Wednesday, 16 Jul 2014, 1:30pm - 2:45pm
    - Location: Room 07 A/B
- Many other Geodatabase sessions can be found in the User Conference agenda
  - http://esriurl.com/ucagenda

Thank you…

- **Please fill out the session survey:**

First Offering ID: 1189

Second Offering ID: 1410

Online – www.esri.com/ucsessionsurveys

Paper – pick up and put in drop box

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Understanding our world.